

The U.S. Jet Transport Industry

Competition, Regulation, and Global Market Factors Affecting U.S. Producers

U.S. DEPARTMENT OF COMMERCE
INTERNATIONAL TRADE ADMINISTRATION



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In response to P.L.108-176, Section 819



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Abbreviations and Acronyms

ACARE	Advisory Council for Aeronautics Research in Europe
AJCA	American Jobs Creation Act of 2004
ASCM	Agreement on Subsidies and Countervailing Measures
ASM	available seat mile
ATA	Air Transport Association
ATCA	Agreement on Trade in Civil Aircraft
ATM	air traffic management
AVIC	Aviation Industries of China
BAA	bilateral airworthiness agreement
BASA	bilateral aviation safety agreement
BIS	Bureau of Industry and Security
CAB	Civil Aeronautics Board
CAEP	Committee on Aviation Environmental Protection
CASA	Construcciones Aeronáuticas S.A. (Spain)
CASM	cost per available seat mile
CCL	commodity control list
CEO	chief executive officer
CFIUS	Committee on Foreign Investment in the United States
COCOM	Coordinating Committee on Multilateral Export Controls
CONUS	continental United States
CPA	critical project appraisal
CRJ	Canadair regional jet
DDTC	Directorate of Defense Trade Controls
DOC	U.S. Department of Commerce
DOD	U.S. Department of Defense
DOT	U.S. Department of Transportation
EAA	Export Administration Act
EADS	European Aeronautic, Defense, and Space Company
EAR	export administration regulations
EASA	European Aviation Safety Agency
EC	European Commission
ECA	export credit agency
ECAC	European Civil Aviation Conference
ECGD	Export Credits Guarantee Department (U.K.)
EOI	expression of interest
ERJ	Embraer regional jet
ETOP	extended twin-engine operations
EU	European Union
EUROCONTROL	European Organization for the Safety of Air Navigation
Eximbank	U.S. Export-Import Bank
FAA	U.S. Federal Aviation Administration
FARs	federal aviation regulations

FCPA	Foreign Corrupt Practices Act
FHI	Fuji Heavy Industries
FP	framework program
FSC	Foreign Sales Corporation
FTC	U.S. Federal Trade Commission
FY	fiscal year
GAO	U.S. General Accountability Office
GATT	General Agreement on Tariffs and Trade
GDP	gross domestic product
GE	General Electric Company
GEAE	General Electric Aircraft Engines
GECAS	GE Commercial Aviation Service
GPS	Global Positioning System
ICAO	International Civil Aviation Organization
ITAR	International Traffic in Arms Regulations
ITC	U.S. International Trade Commission
JAA	Joint Aviation Authorities
JAR	joint aviation requirements
KAI	Korea Aerospace Industries
KARI	Korea Aerospace Research Institute
KfW	Kreditanstalt für Weideraufbau
KHI	Kawasaki Heavy Industries
LCA	large civil aircraft
LCC	low cost carrier
MALIAT	Multilateral Agreement for the Liberalization of Air Transport
MANPADS	man-portable air defense systems
MHI	Mitsubishi Heavy Industries
MRO	maintenance, repair, and overhaul
MTCR	Missile Technology Control Regime
NAC	National Advisory Council
NASA	U.S. National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
OAAI	Office of Aerospace and Automotive Industries
OECD	Organization for Economic Cooperation and Development
RASM	revenue per available seat mile
R&D	research and development
RBF	royalty-based financing
RDT&E	research, development, testing, and evaluation
RJ	regional jet
SARPs	standards and recommended practices
SARS	Severe Acute Respiratory Syndrome
SNECMA	SNECMA Moteurs
SOE	state-owned enterprise
UAV	unmanned aerial vehicle
USOAP	Universal Safety Oversight Audit Program
USML	U.S. Munitions List

VAT	value-added tax
WA	Wassenaar Arrangement
WTO	World Trade Organization

Executive Summary

This U.S. Department of Commerce study responds to a request by Congress to examine market developments and government policies influencing the competitiveness of the United States jet transport aircraft industry. Section 819 of the “Vision 100–Century of Aviation Reauthorization Act” (P.L. 108-176) established the objectives of the study. The report focuses primarily on U.S. and European manufacturers of civil jet transports with 100 seats or more (referred to as large civil aircraft or LCA), as well as of the engines and major subsystems for those aircraft.

The report highlights the significant challenges facing the U.S. aerospace industry and the role government policies have on the competitiveness of U.S. industry. U.S. commercial aerospace companies involved in production of LCA have lost significant market share over the last 25 years to their European competitors. The Boeing Company is the only remaining U.S. manufacturer of large civil aircraft (down from three companies in the 1970s), and has laid off nearly a quarter of its work force since September 11, 2001. For the first time in history, in 2003 the European aircraft manufacturer Airbus delivered more commercial aircraft than Boeing and it did so again in 2004. U.S. manufacturers of aircraft engines have experienced similar (albeit less drastic) losses of global market share to their European competitors. U.S. LCA manufacturers also are facing increased competition from Canadian and Brazilian manufacturers of smaller regional jets, which increasingly are being used by airlines on routes traditionally served by large civil aircraft.

Chapter 2 - Review of Literature on Government Policy

Aerospace issues receive significant attention from policy-makers and in public debate. Many studies prior to this have sought to analyze the competitive position of U.S. and European aerospace companies, and the impact of government policies on the global aerospace industry.

The United States’s reports generally focus on the actions of European governments to support the competitive position of European aerospace manufacturers, and call for less government involvement in aerospace industrial affairs. In turn, European reports cite the global dominance of U.S. aerospace companies as justification for continued intervention in aerospace markets on behalf of European companies.

Chapter 3 – Evolution of the Commercial Aviation Industry

The U.S. domestic passenger airline industry was the subject of economic regulation by the federal government for more than 50 years before being deregulated in 1978. Initially, deregulation evolved as expected as large numbers of new airlines entered the system, unleashing intense price competition that led to several years of rapidly declining fares and a marked increase in air traffic growth. In response, pre-deregulation airlines created revenue-side advantages of size that evolved into hub-and-spoke networks, eventually forcing many of the new entrants out of the market. The economic downturn and the first Persian Gulf War in the early 1990s caused a number of years of stagnation in the market.

The European domestic aviation market underwent a slightly later round of deregulation starting in 1987 with the introduction of three liberalization packages of legislation. This legislation had the effect of establishing a common European market for aviation services, bringing to Europe many of the same benefits of increased service and more competitive pricing as were experienced in the U.S. market.

U.S. industry responded to the underserved domestic leisure travel market that existed in the early 1990s with a second wave of low-cost carriers (LCCs), which led to the second period of strong traffic growth from early 1993 through early 2000. Southwest Airlines arguably provided the blueprint for U.S. and European LCCs effectively competing with the dominant network airlines—maintaining a substantial cost advantage that allows it to profitably charge much lower prices, although there are some differences among LCC business models. Legacy carriers such as United and American Airlines stayed competitive by narrowing their focus on high-fare business travelers until that demand collapsed in late 2000, signaling a structural change in the industry. The ability of legacy carriers to restructure their operations in line with changing market dynamics will be a key determinant of their future role in the industry.

The relative operating cost structure of U.S. airlines has not changed much over time, even when accounting for the significant growth in the low-cost carrier market segment. Labor, fuel and equipment expenses still make up about two thirds of total average operating costs for U.S. airlines. LCCs have much lower average costs than legacy carriers in most categories. Differences between labor unit costs for the legacy and low-cost carriers have accounted for roughly half of the overall difference in operating cost. Fuel continues to be an unpredictable cost burden for all air carriers.

Overall, airline deregulation has led to positive structural changes including better service to most communities and more competition for most customers. Increased competitiveness of the airline industry has enormous implications for economic growth. Deregulation has had a significant impact on aircraft manufacturing as well. Increasing service has led to increased procurement of new aircraft, engines, and parts. As markets have evolved, new aircraft models have been introduced to meet new market demands. In particular, increasing liberalization of domestic and international markets has been closely linked to declining average size and increasing operating distance of commercial jet transport aircraft, including rapid growth in the use of regional jets.

Chapter 4 – Prime Manufacturers – Concentrated Leadership

Prime manufacturers around the world of large civil aircraft (LCA) and related engines share the common characteristics of geographically concentrated corporate ownership and final assembly, increasing focus on systems integration of components and subassemblies, and growing reliance on a globally distributed supplier base for parts as well as risk-sharing investment in new programs. U.S. prime manufacturers have broadly distributed production across the United States and around the world, and rely on international suppliers and wholly owned subsidiaries in other countries. European prime manufacturers have facilities across Europe, but are somewhat less broadly distributed outside of the European Union.

Two manufacturers now dominate global production of large civil aircraft: Boeing (United States) and Airbus (European Union). Boeing and Airbus offer largely similar product lines in terms of size categories, range and cost, although there are differences in how the aircraft are manufactured and operated. Each new generation of aircraft from Boeing and Airbus has been introduced with new innovations, but basic aircraft design has not changed radically since Airbus entered the market 30 years ago. What has changed dramatically over the last 30 years is the competitive position of these two companies. Airbus has steadily been expanding its market position since it began selling aircraft in 1974.

Civil aircraft orders understandably tend to be closely tied to the economic health of the airlines and the economy generally. Orders and deliveries dropped following the high fuel prices in the 1970s and again in the early 1980s. Rapid growth of the airline industry in the mid-1980s yielded a corresponding spike in civil aircraft orders, culminating in a record announcement of 1,543 aircraft ordered in 1989. Orders for both companies dropped dramatically in 1991 at the advent of the first Gulf War, and did not recover until the mid-1990s.

Boeing is changing its business strategy to focus on high-margin business elements—integration and systems engineering—and shedding some historical manufacturing activities thereby limiting the scope of their design work. Boeing also is relying more on foreign suppliers of equipment, components, and even engineering services. This strategy reportedly is being used to drive down production and overhead costs, spread the risk associated with new aircraft programs, and in some cases in an effort to gain a foothold in important markets for new sales.

Airbus, a subsidiary of the European Aeronautic, Defense, and Space Company (EADS) and BAE Systems PLC (BAE), maintains a manufacturing footprint almost exclusively within European Union borders. However, Airbus is increasing its reliance on foreign risk-sharing partners and suppliers, most dramatically on its newest projects, the A380 and proposed A350.

Global production of regional jets is dominated by two manufacturers: Bombardier (Canada) and Embraer (Brazil). Production of current-generation regional jets (RJs) has grown exponentially over the last 11 years from two RJs delivered in 1992 to well over 300 delivered in 2003. Bombardier and Embraer have completely displaced European RJ manufacturers (BAE and Fokker) in the global market. Both RJ manufacturers rely significantly upon U.S. suppliers for hardware, but have varying levels of direct investment in U.S. manufacturing facilities. U.S. airlines also are the primary customers of current generation RJs.

The financial performance of the regional jet manufacturers has been mixed. Embraer and Bombardier both experienced rising net income in the late 1990s as deliveries of RJs grew, peaking in 2001. Embraer has successfully weathered the post-September 11 downturn with positive net earnings. In contrast, Bombardier net income plunged by nearly \$1 billion U.S. dollars cumulatively between 2001 and 2003.

Three prime companies dominate production of large civil aircraft engines: General Electric Aircraft Engines/GEAE (United States), Pratt & Whitney (United States) and Rolls-Royce PLC (United Kingdom). GEAE, P&W, and Rolls-Royce manufacture civil aircraft engines for most Boeing and Airbus models as well as Bombardier and Embraer regional jets. They also provide

engine overhaul, repair, and fleet management services. Three other engine manufacturers are joint ventures of the big three. SNECMA Moteurs (France) is one of the largest civil aircraft engine producers through their joint venture with GEAE. International Aero Engines, Inc., is a consortium of Pratt & Whitney, Rolls-Royce, MTU of Germany, and Japanese Aero Engines Company. GEAE and Pratt & Whitney have joined forces in the Engine Alliance LLC to produce an engine model for the A380.

The three prime LCA engine manufacturers have similar characteristics. They are highly diversified corporations, with aircraft engines accounting for less than half of their corporate revenues. They produce jet engines for both military and civil aircraft. They have operations and partners around the world, and they work extensively through international manufacturing joint ventures. Standalone U.S. engine companies have lost significant market share to European competitors and international joint ventures.

Chapter 5 – Major Suppliers – The Global Supply Chain

Major suppliers to the prime manufacturers range from multi-billion-dollar companies providing major subsystems such as landing gear, avionics or aerostructures to small companies providing components or services. U.S. and European suppliers continue to dominate most of the major subsystems and components used on Boeing and Airbus aircraft, and increasingly are contributing to new aircraft programs as risk-sharing partners, providing investment capital and taking responsibility for design and production of systems and subsystems supplied to prime companies.

The most significant non-U.S. and non-European aerospace suppliers are based in Russia, Japan, South Korea and China. Russia is seeking to reestablish its position as a prime commercial aircraft and engine manufacturer through joint partnerships on Western programs and through repeated government-led restructuring of the industry. Japanese manufacturers have established positions as world-leading suppliers of components and structures for a wide range of commercial aircraft (especially Boeing and Airbus jet transports) and aircraft engines. The South Korean aerospace industry is relatively mature, again with a focus on supplying commercial aerospace components and producing complete military aerospace equipment.

China is likely to be the largest customer—and possibly an emerging competitor—of the U.S. aerospace industry in the future. China’s aerospace manufacturing base is enormous. U.S. companies (and European companies to a lesser extent) have successfully partnered with Chinese companies that provide components or parts for a number of commercial aerospace programs. However, China also is seeking to become a world-class prime commercial aerospace manufacturing industrial base, both through indigenous development programs and joint ventures with non-Chinese companies.

Chapter 6 – Aerospace Trade Policy Overview

Some of the structural changes in the global aerospace industry are due to government policies, funding, and regulations. A strong aerospace industrial base supports national defense and economic security, technology development, scientific discovery, high-wage manufacturing jobs,

export revenue, and national prestige. The immense technical challenges and start-up costs associated with the aerospace industry limit the global industrial base to a handful of countries and a few major companies. As a result, national and local governments have a long history of intervening in their aerospace industries to help them grow and prosper in critical global markets.

Since the 1970s, the United States has negotiated and entered into a number of major international agreements that have significantly liberalized trade of civil aircraft products and reduced government intervention in the civil aerospace market. Many of those agreements are specific to the aerospace industry. The overriding objective of those agreements has been to lessen (if not eliminate) the influence of government actions and funding on the aerospace industry. There has been stated agreement among parties to these agreements that production and purchase decisions should be based on market dynamics, not government interference.

Tariff reductions have been very successful. The level of government intervention across the board has declined with the signing of each successive agreement. However, weaknesses and areas of dispute still remain. Many provisions of these agreements are becoming outdated for an increasingly global industry, and several are under review or renegotiation. In fact, the United States in late 2004 abrogated the bilateral agreement between the United States and Europe governing trade in large civil aircraft due to the failure of that agreement to achieve its intended objectives of open and fair global trade.

Chapter 7 – United States and European Government Support

Financial Support

Government funding for aircraft-related research and development (R&D) has been the single greatest source of trade friction in the civil aerospace industry. The United States and European governments fund research and development related to commercial aerospace technologies in markedly different ways, which are rooted in historical factors and philosophical differences. International trade disciplines have failed to sufficiently limit government financial support for research and development of aerospace products. The fundamental philosophical differences behind the intent and method of aerospace R&D funding persist.

The U.S. government invests public R&D money in development of long-term breakthrough technologies that benefit the public. U.S. government-funded civil aeronautical basic research programs are open to foreign firms and the results generally are broadly available to U.S. and foreign competitors.

European governments also invest in basic technology advances. However, this funding often is intended to develop new products for near-term application in the large civil aircraft market that will compete against U.S. products. U.S. firm participation in European basic research programs has been limited, likely because many of them are funded for the explicit goal of enhancing European industry competitiveness. The results of this research typically remain the property of the researchers and are not made available to the public.

Unlike the U.S. government, European governments also directly fund development of new civil aerospace products, often intended to compete directly with U.S. products. Often this funding takes the form of launch aid (such as royalty-based financing [RBF] or direct loans and grants for aircraft or engine development,) or funding of infrastructure associated with production facilities. Launch aid reduces the commercial risk to manufacturers of developing or introducing new aircraft and engine models.

Government Intervention in Sales Campaigns

One of the most difficult forms of government support to address is government political intervention in international aircraft sales campaigns. The U.S. government focuses on neutralizing foreign government intervention in sales campaigns. In contrast, a number of high-profile cases of intervention by European authorities raise questions about continued European actions. International trade disciplines prohibiting these activities have failed to end the practice.

Export Financing

International agreements have largely eliminated competitive distortions resulting from government-supported export financing. U.S. and European authorities offer such support in line with those agreements through export credit agencies. The recent ratification of the Capetown convention, which will help to define property rights of creditors and financiers of aircraft transactions, is likely to further enhance global sales of aircraft without providing an advantage to one manufacturer over another.

Bribery

Government policies related to the practice of bribery by private companies have affected aircraft sales in some countries. The U.S. Foreign Corrupt Practices Act (FCPA) of 1977 prohibits payments by U.S. companies and individuals, including exporters of aircraft, to obtain or retain business and has had a major impact on how U.S. companies conduct international business. Up until 1999, European laws on transnational bribery were nonexistent. Accordingly, some European aerospace manufacturers were widely alleged to have engaged in bribery of foreign public officials to win sales at the expense of their U.S. competitors. The U.S. government is working with others to combat bribery and corruption on a number of international fronts.

Chapter 8 – Aircraft Certification and Regulations

Safety

U.S. and European aviation authorities grant safety and airworthiness certification to commercial aircraft and operators. There is significant international coordination and collaboration among civil aviation authorities on safety certification issues. U.S. and European safety regulations and standards are largely based on global aviation Standards and Recommended Practices (SARPs) developed through the International Civil Aviation Organization (ICAO). Certification has on limited occasions been used by European authorities to achieve competitiveness instead of safety

objectives. Typically, certification decisions have been made according to objective safety-related determinations. Nonetheless, the United States appears to be lagging behind Europe in promoting standards and procedures in other countries, with possible implications for global competitiveness of U.S. manufacturers.

Environment

The environmental impact of aviation is one of the key constraints on future growth of aircraft operations. There is increasing attention being given to aviation's environmental impact worldwide. Long-standing concerns about local air quality and the impact of aviation noise on communities around airports are amplified by an additional focus on aviation's potential impact on global climate change. Similar to the SARPs for safety certification, ICAO members develop standards and recommended practices for aviation environmental protection as well. Governments then establish domestic standards and regulations related to aircraft noise and emissions, typically based on these ICAO SARPs. However, environmental regulations have in the past been used to achieve competition-related as well as environmental objectives. Attention to aviation environmental issues has grown in Europe in particular where “green” political parties often hold balancing roles in multiparty governments.

Chapter 9 – Aircraft Operations

International Air Services

Liberalized international aviation markets benefit all aircraft manufacturers by stimulating demand for air services and therefore overall aircraft sales. Airlines can expand service by tailoring services to specific markets, and taking advantage of a wider variety of aircraft size and range, in turn creating new or expanded markets for a wide range of aircraft models. Boeing and Airbus appear to be pursuing diverging strategies related to the international air services market. Airbus has been focusing in recent years on the high-capacity, long-range A380 that is geared toward large-capacity flights between major international hub airports. Boeing appears to be focused on building aircraft for increasingly liberalized markets by introducing the long-range but smaller-capacity 787 that is well suited for long routes with comparatively fewer passengers (although Airbus recently announced plans to develop a new aircraft, the A350, with operating characteristics similar to those of the 787). Regardless of industry marketing strategies, the United States has negotiated bilateral and sometimes multilateral “open skies” agreements with every region of the world to expand air services, benefiting U.S. and European manufacturers.

Air Traffic Management

Air transportation system policies, standards, and procedures in general are usually intended to affect all operators equally and to have no competitive impact on manufacturers of one nationality or another. Industry and government leaders have invested significant resources and effort to further the goal of global interoperability through global standards and procedures and harmonized requirements. U.S. and European leaders are beginning to plan the transition to next-generation air traffic management systems, with multiple implications for aircraft and avionics manufacturers, service providers, and even operators of the system. Both authorities

must continue to pursue interoperability and avoid divergent standards, technologies, or policies in order to limit the competitive impact of air traffic management advances. Increased overall capacity in new air transportation systems may reduce some of the relative reliance on traditional large hub airports, thereby leading to a greater increase in utilization of smaller aircraft and more frequent flights.

Airport Infrastructure

United States and European aviation authorities have regulatory and safety oversight of airports within their borders. However, there are significant differences among the airports in terms of management, ownership, control and financing. The U.S. Federal Aviation Administration (FAA) provides more centralized planning and financing for airports than its counterpart European Aviation Safety Agency (EASA), but it does not operate any airports, unlike some of the European Union (EU) member state governments. U.S. and European airport development and operations are largely based on ICAO standards and recommended practices. Airport infrastructure upgrades necessary to accommodate new aircraft models (such as the new Airbus A380) typically are funded regardless of the nationality of the aircraft manufacturer.

Chapter 10 – Business Operations and Security Regulations

Export Controls

Export controls directly impact international trade in civil aerospace products due to multiple uses for aerospace platforms and components. The technology base that supports the military aerospace industry also supports the civil aerospace industry. While in most cases the hardware is designated as uniquely military or civil in nature, there is a growing population of aerospace systems that are considered either to be civil or military systems based upon relatively minor modifications or differences. This crossover is relevant because different export licensing rules apply to the military and civil versions. As the number of such products increases, export controls will have an increasing impact on trade in commercial aircraft. Export licensing rules also affect international collaboration on development of new commercial aircraft.

Security

Most aviation security policies and requirements affect all aircraft manufacturers the same way, regardless of their nationality. Passengers must go through the same security checkpoints and pay the same security-related fees as part of their airplane tickets, regardless of whether they are flying on a Boeing or an Airbus aircraft or a regional jet. The U.S. government has sought to maintain a balance between ensuring the security of the U.S. aviation system and facilitating the movement of people and goods.

Current aviation security policies and requirements clearly have an impact, albeit often indirect, on U.S. aircraft manufacturers. U.S. airlines have expressed significant concern over a wide variety of security-related costs that affect their ability to purchase, operate and maintain aircraft. Consumer demand also is affected by the “hassle factor” associated with new security screening procedures. A few aviation security requirements, such as mandatory security-related equipment

(e.g. reinforced cockpit doors), directly impact aircraft manufacturers but thus far have not provided one manufacturer a notable competitive advantage over another. This could become a growing issue as new security measures are contemplated to counter threats such as man-portable air defense systems (MANPADS).

Mergers and Acquisitions

Merger reviews under U.S. antitrust law focus on preserving competitive market structures, to the ultimate benefit of consumer welfare. European antitrust reviews tend to focus on prevention of market domination by a leading firm. Increasing integration of U.S. and European markets has led to EU competition authorities reviewing and requiring conditions upon mergers among U.S. companies that have no significant production facilities in Europe. U.S. and European authorities have agreements related to their independent reviews of specific mergers and acquisitions. There is no evidence of a broad EU policy intended to provide European companies a competitive advantage, although some of the highest-profile disputes have centered on aerospace company mergers.

Taxation

Numerous federal, state, and local taxes ranging from the alternative minimum tax to depreciation schedules and international provisions of the Internal Revenue Code affect the manufacturing industry. Domestic tax policies related to the international sale of aerospace products have the most direct impact of all taxes on the U.S. aerospace manufacturing industry, especially given that a significant majority of aircraft, engines, and parts are sold to international customers. Aviation-specific taxes affecting the operators have an indirect impact on manufacturers inasmuch as they affect overall market demand.

Chapter 11 - Implications for Manufacturing Competitiveness

Airline Industry Changes

Structural changes in the global airline industry are changing the nature of competition among manufacturers. Aircraft leasing companies are important customers. The influence of low-cost carriers is growing as they are placing large orders of new aircraft, usually of a single type, in order to meet aggressive growth targets based on solid financial footing. To date, few LCCs have introduced regional jets (RJs) into their fleets, but that dynamic may change. RJs are being introduced by some legacy carriers perhaps as a way to salvage the old business plan that clearly is in jeopardy due to the collapse of high-end demand. LCCs are capturing an increasing share of business travel due to factors such as product improvement and network expansion. Most business travelers continue to use legacy carrier services, but generally are paying lower prices since 2000. Some high-margin business travelers may be permanently shifting to other modes of service rather than traditional legacy airlines.

Recent U.S. airline Chapter 11 filings and the cloud of uncertainty hanging over the passenger airline industry either have not had a drastic impact on manufacturers or have exacerbated their problems, depending on the state of each company before the airline problems began. However,

a Chapter 7 liquidation filing by a major U.S. carrier would have a serious impact on regional jet and large civil aircraft and engine manufacturers.

Aerospace Manufacturing

Aerospace manufacturing is expected to continue the trends of increased focus on systems integration and global partnerships. The largest U.S. firms appear well positioned to maintain a significant presence in global markets. U.S. companies that historically supplied parts and components exclusively to U.S. prime manufacturers face more difficulty maintaining their positions in an increasingly global industry. Large and small aerospace manufacturers in other countries will continue to build expertise and market share, likely at the expense of U.S. producers. To the extent that foreign governments plan to support their manufacturers, competition at all levels likely will become increasingly fierce. U.S. suppliers will continue to seek increasing participation in foreign aircraft manufacturing programs as those programs grow their global market share, but may be at a competitive disadvantage when compared to other suppliers with more experience working on international programs or as risk-sharing partners.

Anticipated Changes in Regulations and Policies

European Privatization

Some European governments are considering reducing the level of government ownership in European aerospace manufacturers. In theory, reduced government ownership would increase the influence of private-sector shareholders and market-based factors over corporate operations. The real long-term impact is difficult to predict, since some of the mergers appear to be driven by political motivations rather than market conditions. If European privatization leads to mergers that create more formidable global competitors that are less subject to competitive market forces, that is likely to have a negative impact on customers in the United States and elsewhere.

Subsidies

In 2004, after years of unsuccessful effort to bring more discipline to European government financial support, the United States challenged European government subsidies to LCA manufacturers at the World Trade Organization (WTO). The WTO proceedings were temporarily suspended in January 2005 to provide an opportunity for bilateral negotiations. The United States's objective in these negotiations is to eliminate new subsidies for the development or production of large civil aircraft. There is precedent for the WTO to address aircraft subsidies, although the most recent aerospace subsidy cases, involving Brazil and Canada, have not completely stopped government funding of aircraft development and sales.

Export Financing

The U.S. government is working with other Organization for Economic Cooperation and Development (OECD) members to update international rules for officially supported export credits to take into account the changing global market for aircraft. The United States and other

OECD members have invited Brazil, not a member of the OECD, to participate as a full negotiating partner in that review. If successful, this will help to bring government-supported export financing for Brazilian as well as Canadian regional jets into line with Export Credit Agency (ECA) support for larger commercial aircraft. These revisions will further help to neutralize financing as a competitive factor in the selection of aircraft. The United States prefers that ECAs serve as lenders of last resort and wants to minimize ECA competition with private-sector financiers, as well as make ECA financing more useful for those airlines that need it.

Bribery

The U.S. government and the Organization for Economic Cooperation and Development (OECD) Working Group on Bribery are continuing to follow up on obstacles to implementation of the OECD antibribery convention. The U.S. government also is seeking to strengthen OECD and other multilateral and bilateral disciplines related to bribery and corruption of public officials. Recent press reports indicate that European aerospace companies are among the business groups pressing their governments to relax antibribery rules. To the extent that bribery and anti-corruption disciplines and enforcement in Europe remain weaker than under the Foreign Corrupt Practices Act (FCPA), European aerospace companies enjoy a competitive advantage in sales competitions to foreign governments or government-controlled airlines.

Safety Certification

Establishment of the new European Aviation Safety Agency (EASA) is likely to reduce the cost and time necessary to receive European certification of new commercial aircraft and engine models introduced by U.S. and European companies. Although progress toward establishment of EASA has been slower than initially planned, there is no indication that the new organization will make biased certification decisions in favor of European manufacturers. It will be important for the FAA-EASA relationship to mature sufficiently in time to avoid any delay in certification of new aircraft models such as the Airbus A380 or the Boeing 787. Diverging trends in U.S. and European certification-related technical assistance to other countries could lead over time to a competitive disadvantage for U.S. companies.

Environment

Environmental standards and regulations may have a significant impact on future competitiveness of U.S. and European aerospace companies. There are two primary areas of concern. The first area is European environmental policies and practices affecting airline operations within Europe that could place U.S. manufacturers and airlines at a competitive disadvantage if they are unfairly biased. The second area of concern relates to different agendas related to development of future global environmental standards and policies. The United States needs to develop an appropriate strategy on civil aviation noise and emissions, and to consider options for future contributions to global standards and procedures in ICAO and elsewhere.

Air Services

Continued efforts to liberalize the global aviation industry will benefit both U.S. and European manufacturers. The U.S. government currently is negotiating bilateral and multilateral “open skies” and other more liberalized air services agreements with countries of all sizes and levels of development. Although U.S. and European officials have continued to discuss perspectives on resuming bilateral Open Skies negotiations in 2005, it is unclear what the results would be in the event that the two parties decide to formally restart negotiations. Global airline alliances will present policy challenges for regulators in the United States and in other countries.

Air Traffic Management

As they seek to transform their respective air transportation systems, U.S. and European authorities must continue to pursue interoperability and avoid divergent standards, technologies or policies in order to limit the competitive impact of these advances. Disputes over systems and policies, such as negotiations over future satellite navigation and timing systems (GPS vs. Galileo), are likely to continue as the United States and other countries develop strategies to transition away from the large existing installed air traffic management (ATM) infrastructure base that now exists.

Airports

Airport development policies appear likely to remain largely unchanged in the near future. Although U.S. and European authorities are considering expansions at existing airports and even development of new facilities, such developments will be done in line with existing regulations and policies.

Export Controls and Security

U.S. and European authorities are in the process of reviewing export control-related regulations and policies. Resulting revisions could impact collaboration and trade for both U.S. and European companies. Consultation among U.S. and European authorities as they consider requirements for new security-related technologies used on commercial aircraft could help to ensure that export controls do not provide an unfair competitive advantage for one manufacturer or the other.

Mergers

U.S. and European governments are not currently pursuing major revisions to merger and acquisition policies. Trans-Atlantic collaboration on policy and merger reviews through formal working groups will help to narrow any remaining differences in government policies. Nonetheless, it will be important to carefully monitor aerospace merger reviews in the future as consolidation of the aerospace industry continues, especially any potential competitive effects of establishing new “national champions.”

Taxation

Aviation-specific taxes and fees do not have much effect on the competitive standing of U.S. vs. European manufacturers in global markets. However, reduced taxes and fees would reduce costs to aviation service providers and passengers, thereby providing at least some indirect benefit to aerospace manufacturers. Non-aviation-specific taxes directly affect aircraft manufacturers as well as operators. In particular, many U.S. aerospace companies benefited from since-repealed Foreign Sales Corporation and similar tax policies, based upon their volume of international sales. The exact impact of new tax provisions adopted in 2004 on U.S. companies is unclear. However, since the European tax regime remains unchanged, European manufacturers may now enjoy a competitive price advantage in global competitions relative to their U.S. competitors.

Chapter 1 – Introduction

This U.S. Department of Commerce study responds to a request by Congress to examine market developments and government policies influencing the competitiveness of the United States jet transport aircraft industry. The report objectives are described in Section 819 of the “Vision 100–Century of Aviation Reauthorization Act” (P.L. 108-176), sections (1) through (5):

“(1) describes the structural characteristics of the United States and the European Union jet transport industries, and the markets for these industries;

(2) examines the global market factors affecting the jet transport industries in the United States and the European Union, such as passenger and freight airline purchasing patterns, the rise of low-cost carriers and point-to-point service, the evolution of new market niches, and direct and indirect operating cost trends;

(3) reviews government regulations in the United States and the European Union that have altered the competitive landscape for jet transport aircraft, such as airline deregulation, certification and safety regulations, noise and emissions regulations, government research and development programs, advances in air traffic control and other infrastructure issues, corporate and air travel tax issues, and industry consolidation strategies;

(4) analyzes how changes in the global market and government regulations have affected the competitive position of the United States aerospace and aviation industry vis-à-vis the European Union aerospace and aviation industry; and

(5) describes any other significant developments that affect the market for jet transport aircraft.”

As required in the legislation, this report is being furnished to three Congressional committees: the Senate Committee on Commerce, Science and Transportation; the House of Representatives Committee on Science; and the House Committee on Transportation and Infrastructure.

In accordance with the stated objectives, the report focuses primarily on U.S. and European manufacturers of civil jet transports with 100 seats or more, as well as of the engines and major subsystems for those aircraft. There is some discussion of civil jet transports with less than 100 seats—usually called regional jets (RJs)—given the sizeable participation of U.S. and European aerospace suppliers in these programs and the growing use of RJs in commercial airline fleets. The study presents trends and analysis of the impact of U.S. and European government policies on these industries and draws conclusions.

The Department of Commerce Office of Aerospace and Automotive Industries (OAAI) prepared the report, in consultation with the Department of Transportation and other federal agencies.¹ The study was based on contributions and information from multiple government agencies and private sector entities. The Commerce Department intends to conduct a public hearing following the release of the report to solicit input and feedback on the issues raised throughout the report.

¹ Department of Commerce Assistant Secretary for Manufacturing and Services Albert Frink and Deputy Assistant Secretary for Manufacturing Joseph Bogosian oversaw the project. Jon Montgomery, Office of Aerospace and Automotive Industries, was the primary author and project coordinator. Other OAAI staff contributors included Jonathan Alvear, Robert Beadle, Fred Elliott, Evan Foster, Ron Green, Victoria Harrison, Theresa Lindo and Kim Wells. Department of Transportation Deputy Assistant Secretary for Aviation Michael Reynolds and Counselor to the Under Secretary Michael O'Malley coordinated contributions from various experts in the Department of Transportation and the Federal Aviation Administration.

Chapter 2 – Review of Literature on Government Policy

Aerospace issues receive significant attention from policy makers and in public debate. Many government studies prior to this have sought to analyze the competitive position of United States and European aerospace companies, and the impact of government policies on the global aerospace industry. Although it would be impractical to review all such studies in this report, the few key reports summarized in this chapter are indicative of the broader body of literature on this subject.

United States

Concerns about European supports have been highlighted for years in the annual U.S. Trade Representative's *National Trade Estimate (NTE) Report on Foreign Trade Barriers*. These reports identify key policies such as government financial support and technical regulations that have most significantly affected U.S. exports over the previous year.² Concerns about aerospace-specific policies are frequently raised in the NTE reports.

Three U.S. International Trade Commission (ITC) reports have been prepared since 1993 specifically focused on the global competitiveness of the U.S. aerospace manufacturing industry. The first report described the increasing global market share and changing corporate structure of European aerospace manufacturers, and suggested that the nature and level of European government support might in the future provide a competitive advantage to European companies.

The second ITC report described the globalization of the aerospace manufacturing industry, but expressed skepticism that new manufacturers of complete large civil aircraft outside of the United States or Europe would present significant competition in the coming 10 to 15 years. This report also suggested that the competitive position of LCA manufacturers likely would rely significantly on their respective abilities to predict and respond to changes in airline demand resulting from improved efficiency and declining government restriction of global aviation markets. The third ITC report highlighted the continuing decline of U.S. manufacturer market share, due predominately to increased competition from European and Asian producers and a declining U.S. aeronautical research and development infrastructure. This report identified competition laws and antitrust enforcement as important considerations for U.S. and European industry competitiveness.

The Government Accountability Office (GAO) has issued reports on government policies affecting the large civil aircraft industry in recent years as well. A 1994 report analyzed the nature and level of European government funding for aeronautic research and development, concluding that this research tends to be focused on enhancing the European aerospace technology capabilities, with a lesser emphasis on civil public interest objectives such as safety and reducing the environmental impact of aviation.³ Two reports from the mid-1990s analyzed the impact of the 1992 bilateral aerospace agreement between the United States and the

² *National Trade Estimate (NTE) Report on Foreign Trade Barriers*, Office of the U.S. Trade Representative, 2004. The 2004 NTE report was the 19th annual edition of this report.

³ *European Aeronautics: Strong Government Presence in Industry Structure and Research and Development Support*, U.S. General Accounting Office, Report GAO/NSIAD-94-71, March 1994.

European Union (see Chapter 6 for more detail on the agreement). These reports noted that the agreement, if effectively implemented, ought to improve the competitive position of U.S. companies by limiting government intervention in the market. At the same time, they questioned the practical effectiveness of the agreement due to disagreements over implementation of key provisions and limitations on disclosure of information exchanged between parties.⁴

Advisory groups have prepared numerous studies largely similar to these U.S. government studies listed above. The *Final Report of the Commission on the Future of the United States Aerospace Industry*, issued in November 2002, provided recommendations to the president and the Congress on addressing the wide range of challenges facing the U.S. aerospace industry. Regarding the large civil aircraft industry, the Commission concluded that the U.S. government should take immediate action to neutralize foreign government market-distorting intervention such as subsidies, tax policy, export financing, and standards to establish a level playing field for U.S. industry to compete globally. The Commission also recommended sustained public investments in long-term research and related infrastructure to foster new breakthrough aerospace capabilities. Many of the Administration's programs and policy reviews address key challenges highlighted by the Commission.

Some reports have focused on the airline industry. Earlier commission reports included the National Commission to Ensure a Strong Competitive Airline Industry report to the president and Congress in August 1993.⁵ At the time, U.S. airlines were facing many similar challenges to those facing today's airline industry, including huge commercial losses among multiple airlines, widespread job loss, especially among commercial aircraft manufacturers, sharply reduced orders, and delayed or cancelled deliveries of new aircraft immediately on the heels of unprecedented gains in production and orders. This commission also raised concerns about U.S. industries' freedom to compete in international markets because of foreign government intervention. The Commission recommended a restructuring of the U.S. Federal Aviation Administration (FAA) in order to enhance aviation safety and efficiency, measures to maintain a stable work force, and a globally liberalized aviation system. It also urged improved international trade disciplines and policies to prevent unfair competition among aerospace manufacturers.

The National Civil Aviation Review Commission chaired by Secretary of Transportation Mineta in December of 1997 outlined a consensus on how aviation funding and safety should be conducted in the future. This Commission highlighted a number of problems with the way the U.S. air transportation system is managed and operated. It called for changes in the way that the air traffic system and airport development are managed and financed, as well as government and industry collaboration on measures to enhance aviation safety.⁶

⁴ *U.S.-E.C. Aircraft Agreement*, U.S. General Accounting Office, Report GAO/GGD-93-41R, June 9, 1993; *International Trade: Long-Term Viability of U.S.-European Union Aircraft Agreement Uncertain*, U.S. General Accounting Office, Report GAO/GGD-95-45, December 1994.

⁵ *Change, Challenge and Competition*, The National Commission to Ensure a Strong Competitive Airline Industry, August 1993.

⁶ *Avoiding Aviation Gridlock and Reducing the Accident Rate: A Consensus for Change*, National Civil Aviation Review Commission, December 1997.

The National Academies of Science Transportation Research Board's September 2003 report *Securing the Future of the U.S. Air Transportation* found that the most critical issue for continued success of aviation is the ability of the air transportation system to accommodate increased demand. The Board recommended establishment of civil aviation as a national priority, development of future operational concepts needed to expand the aviation system, and government-supported, innovative long-range research on new aircraft concepts and technologies.⁷

Europe

European governments have issued multiple studies as well, often conducted in close cooperation with European industry. In January of 2001, a European government and industry panel issued *European Aeronautics: A Vision for 2020*, a report describing possible advances in the aerospace industry over the next 20 years. The *Vision: 2020* report offers recommendations (more political than technical) of how to boost European competitiveness through a coordinated program of aerospace research funding in Europe. The report calls for establishment of a "Strategic Research Agenda" and proposes research priorities related to safety, environment, manufacturing, and air traffic management. The Advisory Council for Aeronautics Research in Europe (ACARE) published its first detailed aerospace research agenda in October 2002.

A European aerospace advisory group consisting of senior government and industry representatives called STAR-21 issued a report in July 2002 including recommendations relating to coordination of a broad range of policies that affect the aerospace industry's ability to meet Europe's current and future strategic needs in the areas of mobility, security and defense, technology, and use of space. Recommendations focused on ways to modernize or upgrade Europe's political and regulatory framework to address rapid economic and technological change in the aerospace industry.

The European Commission publishes the annual *Report on United States Barriers to Trade and Investment*, which includes complaints about U.S. government aeronautical R&D funding and military contracts, as well as other purported trade barriers such as safety certification, military procurement of aircraft, and supposed political intervention in sales campaigns.

Individual EU member states also have contracted or conducted independent studies on the current state of their domestic aerospace industries. In the last two years, U.K., German, and French reports all have urged increases in state civil aeronautical research and development funding in key areas of air traffic management, safety, security, and environmental protection to enhance European competitiveness vis-à-vis the United States. These reports largely echo the findings of the European *Vision:2020* and *STAR-21* reports.

United Kingdom: The U.K. Department of Trade and Industry's Aerospace Innovation and Growth Team, headed by BAE Systems Chairman Sir Richard Evans, issued a report in June 2003 on the future of the U.K. aerospace industry. The report highlights medium-

⁷ *Securing the Future of Air Transportation: A System in Peril*, Committee on Aeronautics Research and Technology for Vision 2050, National Research Council of the National Academies of Science, Transportation Research Board, September 2003.

and long-term issues affecting the aerospace sector, including commercial aviation, defense budgets and policy, aerospace manufacturing trends, labor, and technology. The report calls for a three-fold increase in government funding for civil aerospace research and demonstration projects and improved coordination of education and work force development programs. It also urges more attention to the key issues of air traffic management, safety, security, and environmental protection.⁸

Germany: The German government issued in 2003 a strategic review of its government aerospace research activities over the previous five years, and urged closer European research coordination on key future topics including environment, energy efficiency, air traffic control, and balancing business and security needs.⁹ A strategic agenda for the German aerospace industry was issued in 2004 by a group of German industrialists and government researchers, calling for transformation of the air transportation system, protection of (and investment in) domestic aerospace core competencies, integration of research activities with other European entities, and enhanced public appreciation of the value of the aerospace industry to Germany.¹⁰

France: In February 2004, French aerospace executive Yves Michot issued at the behest of French Prime Minister Jean Pierre Raffarin the *Report on the French Aerospace Industry*. This report urged a “substantial” increase in public funding to French aerospace companies, coordination of government research and development activities, centralized military program management within the French government, and increasing domestic investment in French companies while “applying strict control procedures for foreign investments.”¹¹

These and numerous other reports reveal that the fundamental U.S. and European debate over government aerospace policy has changed very little over the last twenty years. What has changed, however, is the nature of competition and the companies themselves. These policies and debates have not kept pace with the structural changes in the global aerospace industry.

⁸ *An Independent Report on the Future of the U.K. Aerospace Industry*, Aerospace Innovation and Growth Team, U.K. Department of Trade and Industry, June 2003, www.dti.gov.uk.

⁹ *Innovationsmotor Luftfahrt: Die Luftfahrtforschungsprogramme der Bundesregierung—Bilanz und Ausblick*, Germany Ministry for Industry and Labor, July 2003, www.bmwa.bund.de.

¹⁰ *Bericht der High-Level Group - Deutsche Luft- und Raumfahrt: Zukunftsbranche des 21. Jahrhunderts im europäischen und globalen Wettbewerb*, issued by BDLI (Bundesverband der Deutschen Luft- und Raumfahrtindustries e.V., 2004, www.bdli.de.

¹¹ *Report on the French Aerospace Industry*, Yves Michot, February 2004.

Chapter 3 – Evolution of the Commercial Aviation Industry

The deregulated airline industry has been the subject of intense scrutiny over the years. Every objective review of the evidence—by the Department of Transportation, the Brookings Institution, the Transportation Research Board of the National Research Council, the Government Accountability Office (GAO), and a host of independent studies by academics and consulting firms—has concluded that airline deregulation has been a huge success. Positive structural changes have led to better service to most communities and more competition for most customers. Empirical results are clear—real fares are dramatically down and traffic trends are strongly up as a consequence of deregulation.¹²

After deregulation, air transportation has been a more important growth component of the travel and tourism industry, already arguably the world's largest industry, driving as much as 10 percent of all jobs and investment worldwide. It has been estimated that by 2010, the impact of air transportation on the global economy will approach \$1.8 trillion annually, accounting for more than 31 million jobs worldwide.¹³ Expansion of the global airline industry (passenger as well as cargo) has enormous implications for economic growth.

Deregulation has had a significant impact on aircraft manufacturing as well. Increasing service has led to increased procurement of new aircraft, engines and parts. As markets have evolved, new aircraft models have been introduced to meet new market demands.

3.a. Evolution of Commercial Air Service

Old School (Pre-1978)

The U.S. domestic airline industry was the subject of economic regulation by the federal government for more than 50 years before being deregulated in 1978. Following initial regulation of airlines by the U.S. Department of Commerce in 1926, the Civil Aeronautics Authority was created in 1938, and was renamed the Civil Aeronautics Board (CAB) in 1940. The principal reason for economic regulation of the industry was concern that unregulated competition in the fledgling industry could have disruptive effects on service and safety, and might even ultimately lead to a monopoly. The CAB had broad economic authority over the industry. It controlled the routes carriers could serve (or those they could cease to serve), the prices they could charge, and new entry into the system. While the CAB's regulatory policies varied over time, as a general proposition the CAB tended to seek stability in the system.

Airlines predominantly provided linear systems of service by crisscrossing flights between cities on their systems with many small cities serving as intermediate points on those linear flights. Most cities, therefore, had direct access and even reasonable single-carrier service to only a small number of larger destinations. To get to other destinations, passengers typically had to make inconvenient connections, often on two or more carriers.

¹² DOT Form 41 reports.

¹³ *The Economic Benefits of Air Transportation*, ATAG, 2000.

This form of regulation and operation was not unique to the United States. Domestic aviation markets in Europe and around the world closely mirrored the U.S. market, with varying levels and forms of control over the system.

Deregulation (1978–1993)

The U.S. domestic airline industry changed dramatically following deregulation in 1978. In the absence of economies of scale or barriers to entry, deregulation was expected to allow entry to the aviation market by numerous smaller firms. Their lower costs would discipline the market and cause pre-deregulation carriers to become more efficient or fail. Indeed, new entry would be so easy that merely the threat of entry would lead to lower prices and better service.

Initially, deregulation evolved as expected. From 1978 to 1984 large numbers of new entrant airlines entered the system, most with much lower operating costs than the pre-deregulation airlines. These new airlines unleashed intense price competition that led to several years of rapidly declining fares and a marked increase in traffic growth.

Very early on, however, the pre-deregulation airlines departed from the deregulation script. They did so by creating revenue-side advantages of size, or revenue economies of scope, that deregulation architects had not considered. This began with the development of hub-and-spoke network systems of service. By feeding traffic from spoke cities to their network hubs, carriers were able to consolidate passengers on flights going to other destinations. These networks enabled them profitably to provide more service to spoke cities than would otherwise be economically feasible. The service from the spoke city to the hub carried not only local passengers who were traveling between those two cities, but also passengers who connected at the hub city to other cities on a carrier's network.

Networks resulted in increased frequency and often more competitive service in scores of markets, since most cities were spokes to network hub cities of multiple airlines. As the airlines developed their respective networks, superior service to many cities and inter-network competition for connecting passengers stimulated demand and contributed to the strong growth pattern already initiated by the entry of new airlines. The combination of new entry and the development of hub-and-spoke networks led to a strong period of growth from early 1981 through early 1988.

As the network airlines expanded their networks, largely through consolidation, they were able to take advantage of the market power they developed at their network hub cities, particularly in large, short-haul markets. Exploiting revenue-side network economies of scale and scope became a central strategy for achieving high yields to compensate for higher operating costs, rather than competing with new entrants on cost, as had been anticipated. Hub dominance, the development of sophisticated yield-management and computer reservation systems, and other measures such as frequent flyer programs enabled the large network airlines (e.g. legacy airlines) to prevail in competition with the first wave of new entrant airlines, resulting in the acquisition or failure of most of these new carriers by the late 1980s. This, combined with an economic downturn and the first Persian Gulf War in the early 1990s, resulted in a sustained five-year period of little growth domestically from early 1988 through early 1993.

The lack of growth was, in part, due to the business model used by the legacy carriers. This model focused on maximizing the number of high-fare business travelers instead of leisure passengers unwilling to pay higher prices. A core component of the business strategy was to maintain a constant percentage of high-yield passengers by minimizing the availability of cheaper seats. The legacy carriers, all with similar cost structures and using the same business model that targeted high-fare passengers, simply did not provide sufficient service for a large part of the domestic market.

U.S. domestic deregulation also affected international service and competition. The transatlantic market began to experience robust traffic growth in 1982 as U.S. domestic network airlines began to compete across the Atlantic. Throughout much of the 1980s, U.S. industry not only experienced strong growth, but also gained market share. Directly linking their strong domestic networks to Europe resulted in superior service compared with that previously provided by Pan American and Trans World on an interline basis, and gave these new carriers a competitive advantage to interior U.S. markets that European airlines had to continue to serve on an interline basis in combination with the same U.S. carriers that no longer had an incentive to cooperate.

This shift in competitive balance led to restructuring in other domestic markets as well, prompting a response by foreign carriers to expand their own hub networks to feed their own international operations. U.S. domestic deregulation, therefore, was the basis for fundamental structural change in the transatlantic market, as well as in the European domestic market. It is likely that the growing presence of the relatively lean U.S. network competitors was the driving force behind the decision of many European governments to privatize their airlines during the late 1980s to the late 1990s.

Many of the changes in the domestic U.S. aviation services market are being repeated in Europe, spurred by a series of liberalization measures introduced by the European Union. The European airline industry historically had been highly regulated, with national quotas on flight capacity and fixed prices. A first package of measures adopted in December 1987 by the EU started to relax the established rules by limiting the right of governments to object to the introduction of new fares and allowing some airlines to share seating capacity under certain conditions.

In June 1990 a second package of measures opened up the market further, allowing greater flexibility over the setting of fares and capacity sharing. Moreover, the new provisions were important steps toward the creation of a single common market within Europe for European airlines. It opened up third and fourth freedom operations to all European Community carriers in general, as well as extended the right to fifth freedom operations.¹⁴ These measures, which were initially limited to passenger airlines, were extended to cargo carriers in 1991.

¹⁴ *Third freedom* is the right to deplane traffic in a foreign country that was enplaned in the home country of the carrier. *Fourth freedom* is the right to enplane traffic in the foreign country that is bound for the home country to the carrier. *Fifth freedom* is the right to enplane traffic at one foreign point and deplane it in another foreign point as part of continuous operation also serving the airline's homeland. <http://ostpxweb.dot.gov/aviation/index.html>.

New Markets, New Players (1993–2001)

U.S. industry responded to the underserved domestic leisure travel market that existed in the early 1990s with a second wave of low-cost carriers (LCCs), which led to the second period of strong traffic growth from early 1993 through early 2000. Southwest Airlines had continued to exist throughout the post-deregulation period after making the transition from an intrastate operator, and arguably provided the blueprint for effectively competing with the dominant network airlines—maintaining a substantial cost advantage that allowed it to profitably charge much lower prices. After the second wave of low-cost new entrant airlines surfaced beginning in 1993, the industry underwent several very contentious years of competition between the LCCs and the legacy network airlines.

Throughout the period from 1993 to the end of the decade, the U.S. legacy carriers employed various strategies designed to discourage the presence of, or at least slow the growth of, these new carriers with some success, until high-fare business demand collapsed in late 2000. And while many of these new entrant carriers ended in failure, several survived and have now reached critical mass that allows them to continue to aggressively and profitably expand. Thus, by 2000, the U.S. passenger airline industry had gone through two extended periods of substantial adjustment as individual airlines acted and reacted to one another's competitive overtures.

The transatlantic market had a period of limited growth in the early 1990s that was accompanied by substantial increases in price, similar to the sluggish growth in the U.S. domestic market mentioned above. The development of multiple immunized alliances beginning in 1993 helped to reverse that trend in the transatlantic market, contributing to improved service and competition and declining prices.¹⁵ Therefore, like the U.S. domestic process, early international developments have been consistent with expectations that liberalization will result in better service, increased competition, and the accompanying growth.

The air cargo segment of the aviation business within the United States and around the world also grew dramatically through the 1990s. All-cargo airlines and even passenger carriers expanded operations to facilitate the increasing reliance on just-in-time manufacturing, global shipping of relatively small, high-value products, and the increasing international reach of small and large companies. The introduction of new aircraft into the global passenger fleet freed up older aircraft to be converted for cargo operations, complementing new aircraft being purchased directly by cargo airlines.

European deregulation gained momentum in January 1993 with the introduction of the third liberalization package, gradually introducing broad freedom to provide services within the European Union. By April 1997, airlines of one member state were permitted to operate routes wholly within another Member State, known as the freedom to provide “pure cabotage.”¹⁶

¹⁵ Immunized alliances are airline business partnerships that receive immunity from U.S. antitrust laws in connection with government approval. Among other things, alliance partners jointly set prices and routes and integrate core airline functions such as revenue management and sales and marketing to provide seamless service across their respective networks.

¹⁶ Pure cabotage, also known as *ninth freedom* rights, enables an airline of one country to operate flights and carry traffic solely between two points in a foreign country.

The third package also permitted EU airlines to establish themselves in any EU member state and obtain an operating license. Now all intra-EU routes are available to all EU carriers. Technical and fitness criteria for airline operations are harmonized across the EU. The “fitness” rules cover safety standards, financial structure, liquidity, insurance, technical standards, license duration, and monitoring methods.

Some restrictions remain. EU airlines must be based in the EU and be owned and effectively controlled by EU member states or nationals.¹⁷ EU airlines are permitted to set their own fares on services provided within the EU, subject to safeguards against predatory pricing or unreasonable price rises. The national aviation authority may ask the European Commission to intervene only when economy fares become excessively high in the absence of significant competition. Conversely, the national authority can object to a fare drop if airlines are involved in a price war that has led to two consecutive and general drops in fares and none of them is making any profit on the route concerned. In practice, the authorities have rarely intervened.

European studies have indicated that there was significant development in the number of routes operated immediately following the introduction of the third package. The highest level of growth was between intra-European city-pairs.¹⁸ Traffic between domestic city-pairs (within a single European country) grew to a lesser extent. In both cases, some of these new city-pairs were subsequently withdrawn.

In the wake of deregulation, European LCCs are establishing themselves and changing European market dynamics. Starting with Ryanair operating from Ireland in the mid-1990s, there are a number of LCCs with expansive European operations and as many as 60 no-frills carriers in EU countries.¹⁹ Not only are they opening new markets, they also are taking market share from traditional network carriers. Only 15 to 25 percent of European domestic flights currently are served by the LCCs, compared to 25 to 30 percent of flights in the United States.²⁰ Nonetheless, their market share is growing.

European LCCs follow the same general operational models as their U.S. counterparts, relying on lesser-used airports, fleet commonality, increased equipment utilization, direct flights, and lower personnel costs to provide better operating economics. There is one important difference in Europe, however—European LCCs face additional competition from Europe’s high-speed rail network.

A Struggling Industry/A Bright Future for Some (2001–present)

Another fundamental restructuring of the U.S. passenger airline industry is now taking place. That restructuring is attributable to two simultaneous phenomena: first, the disappearance of high-end demand for air travel toward the latter part of 2000; and second, the evolution of LCCs

¹⁷ European Council Regulation (EEC) No. 2407/92 requires that European air carriers be owned and continue to be owned directly or through majority ownership by member states and/or nationals of member states.

http://europa.eu.int/comm/transport/air/rules/competition_en.htm.

¹⁸ <http://airlinesgate.free.fr/articles/industry4.htm>

¹⁹ Data from <http://www.attitudetravel.com/lowcostairlines/europe/index.html> as of June 28, 2004.

²⁰ *State of the European Airline Industry*, Secretary General Ulrich Schulte-Strathaus, Association of European Airlines, July 8, 2003.

into a powerful market class that represents a mix between the old and the new. Broad comparisons between the legacy carriers and the new LCCs point to the change underway.

The legacy carriers have suffered enormous financial losses during each of the past four years while significantly shrinking their mainline operations. That is not surprising in an environment characterized by the terrorist attacks of September 11 and their aftermath, Severe Acute Respiratory Syndrome (SARS), the war in Iraq, high fuel prices, and a general economic downturn. But at the same time, during the most challenging operating environment the industry has faced during the past 25 years, LCCs as a group managed to earn profits and expand market share (although profitability was not uniform among all LCCs).

The evidence now suggests that the decline in high-end demand toward the end of 2000 was not merely another cyclical change, but signaled an important structural change. It was attributable to factors like increased accessibility to new services and fare price transparency provided by the Internet, and the LCCs' growing networks and improved service quality. These developments have seriously compromised the ability of legacy carriers to charge high prices to their high-end customers, placing enormous pressure on them to reduce their cost structures and revise their business models. High-end fares have declined not merely on routes served by LCCs; they have declined even on routes where there is no current LCC competition.

As traffic has picked back up, the high-fare business traveler remains noticeably absent. Legacy carriers are no longer able to avoid cost-side pressures by focusing on a smaller number of high fares, or protect market share by controlling capacity at key airports. That strategy no longer works. Most business travelers continue to use legacy carrier services, but the prices they pay generally have declined since 2000. Some of those business travelers willing to pay higher prices are moving to other forms of travel such as privately owned and operated business jets. These changes represent watershed developments in the deregulation process. The cost competition envisioned by deregulation architects is now actively underway.

There is little doubt that the LCCs will continue to expand the scope and density of their networks. The market presence of LCCs has been established by long-standing LCCs like Southwest and by new start-ups like JetBlue, AirTran, and Frontier. The LCC market is sufficiently mature that long-established LCCs are moving new aircraft into their fleets and new LCCs are initiating service with all new aircraft. The role of the legacy carriers in the future will depend in large part on how successful they are in adjusting their business models to meet new market dynamics.

3.b. Airline Cost and Revenue Trends

A review of major airline cost and revenue trends can help to explain the changing dynamics of the aviation industry.²¹ Some costs are similar across different segments of the industry. However, fundamental differences between legacy carriers and low-cost carrier revenue and cost structures exist. The ability of legacy carriers to restructure their operations in line with changing

²¹ The DOT Form 41 reports are the sources for all the data contained in this section. Costs reported on DOT Form 41 Reports are not adjusted for inflation.

market dynamics will be a key determinant of their future role in the industry.

Passenger airline operating expenses include expenses related to services (air traffic control, security, airport infrastructure, etc.) as well as costs directly related to operation of an aircraft such as labor and fuel. The overall cost structure of U.S. passenger airlines has not changed much over the last 25 years. Figure 1 ranks the relative importance of the major airline cost centers in 1978 and 2003, according to data reported by airlines on DOT Form 41.

Figure 1: Ranking of Airline Major Cost Centers

1978	2003
1 - Salary & Benefits (44.1%)	1 - Salary & Benefits (37.3%)
2 - Fuel (20.1%)	2 - Equipment (15.4%)
3 - Equipment (9.3%)	3 - Fuel (13.7%)
4 - Commissions (4.0%)	4 - Landing fees (2.3%)
5 - Food (3.5%)	5 - Food (1.6%)
6 - Landing fees (1.9%)	6 - Commissions (1.5%)
7 - Insurance (0.5%)	7 - Insurance (1.2%)
8 - Transport related and Other (16.5%)	8 - Transport related and Other (27%)

Source: DOT Form 41 Reports

In both years, the three most important individual cost components are: salary and benefits, equipment (including depreciation, amortization of capital leases and rental expenses, but not interest expense on debt), and fuel. A variety of expenses not reported individually by airlines to the Department of Transportation are included in the “transport related”²² and “other”²³ categories.

Differences Between the Legacy and Low-Cost Carriers

The ability of LCCs to offer lower fares to passengers can be explained by comparing the overall relative operating costs of LCCs versus those of the legacy carriers. Since the growth of the LCCs has been a more recent development, operating costs are compared over the period of calendar year 1991 through 2003.²⁴ Chart 1 compares the industry average cost per available seat mile (CASM), equal to the cost to an airline of flying one seat one mile, and corresponding revenue per available seat mile (RASM) for LCCs and legacy carriers.

As shown in Chart 1, LCC cost and revenue per ASM are significantly lower than those of legacy carriers. Another notable difference is the comparison of revenue and cost per ASM for

²² Transport related expenses are incurred in the generation of revenues from services which grow from and are related to the air transportation services performed by the air carriers, ranging from the cost of in-flight beverages sold to movies rented to payments to code-sharing regional subsidiaries and affiliated partners.

²³ Other expenses include security expenses, maintenance expenses, and all other operating expenses not specifically shown as an individual item.

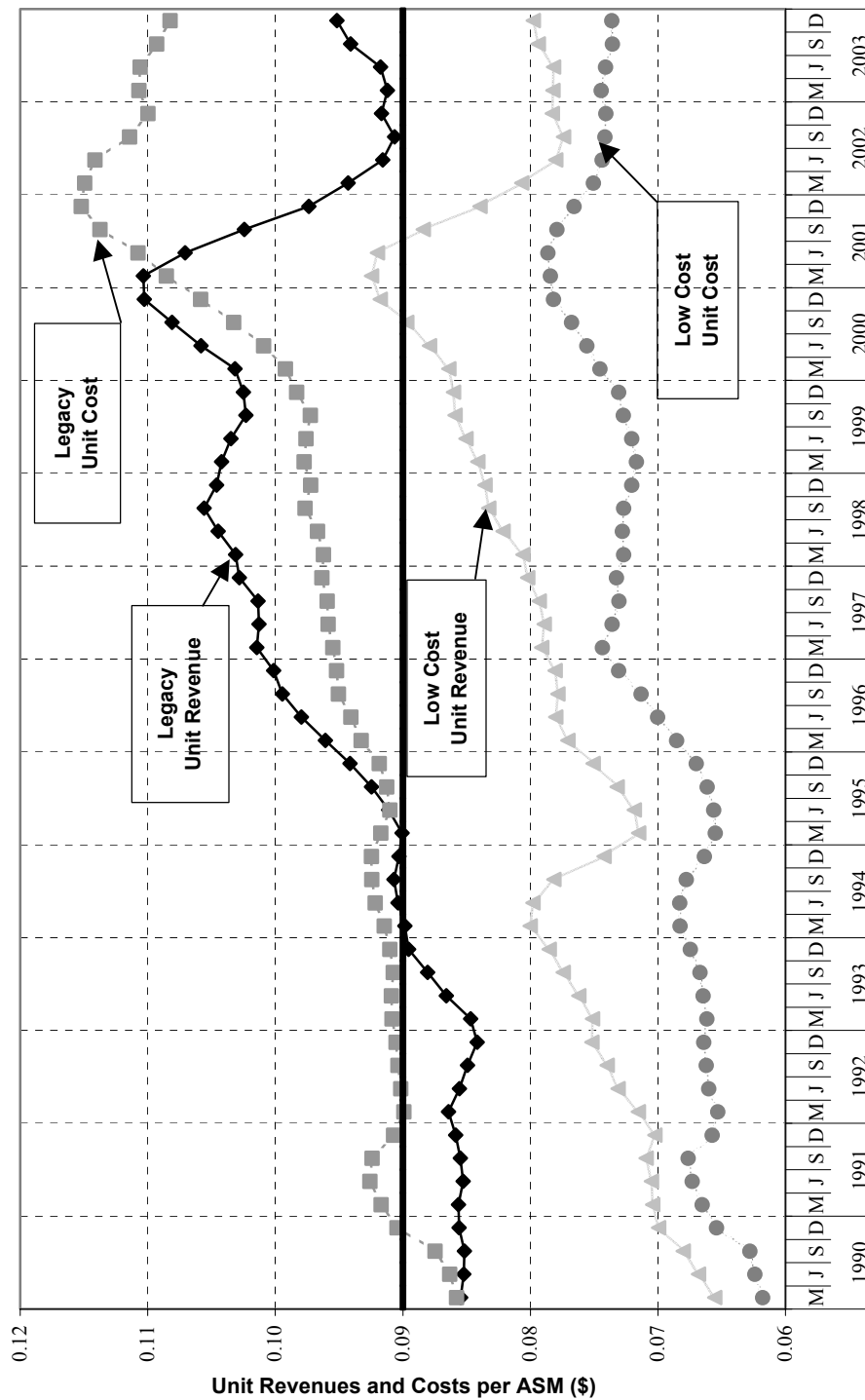
²⁴ The financial data has not been adjusted for inflation, although this has no impact on the year-by-year comparison of LCC vs. legacy carrier operating costs. In addition, the unit costs have not been adjusted for differences in distances operated. The average distance or “stage length” for the legacy carriers has been substantially higher than the stage length for the LCCs. If adjustments were made for the differences in stage length, the gap in unit costs between the legacy and low costs carriers would be even greater than shown.

each type of airline. Since 1990, the LCCs as a group have managed to consistently maintain higher revenue than cost per ASM. In contrast, legacy carrier revenue per ASM was below cost per ASM from 1990 to 1995. Through the latter half of the 1990s, the legacy carriers managed to keep revenues in pace with costs, with a CASM increase of only about one cent over an eight-year period. Then, within the two-year period of 2000–2001, there was a sharp increase in legacy CASM by nearly 2 cents. Towards the end of 2000, cost for legacy carriers again outpaced revenue per ASM. RASM dropped sharply in 2000 and continued to fall until 2002.

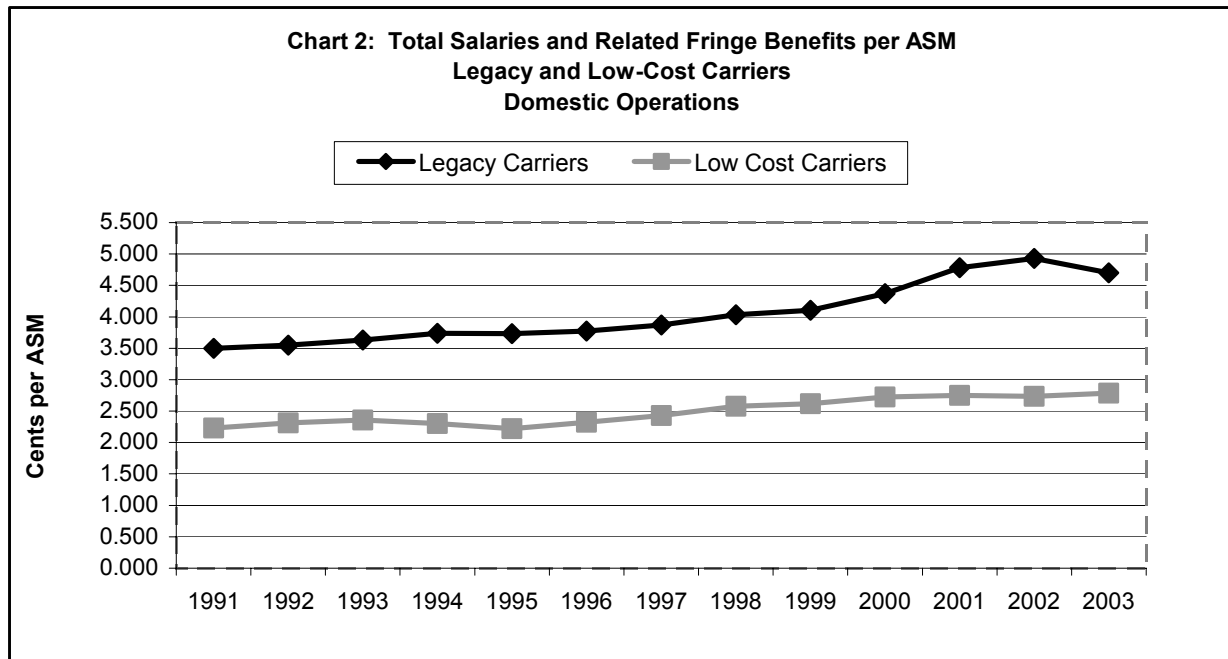
It is important to note that revenue per ASM for both LCCs and legacy carriers began to drop sharply at the beginning of 2001—prior to the September 11 terrorist attacks. However, legacy carrier CASM continued to climb in 2001 while LCC CASM declined. Although legacy carriers have made significant progress in reducing costs, those reductions have not been enough to make up for declining revenues. Even if the legacy carriers were able to double over the next year the cost savings they achieved through 2003, their costs likely would still outpace revenues, and they will remain at a cost disadvantage in comparison to the LCCs.

In contrast to domestic markets, high-fare demand in international markets has substantially recovered. For this reason, U.S. legacy carriers now are focusing their capacity growth in international markets that have been exposed to very limited LCC competition. Although LCCs are likely to enter the international market in the future, legacy carriers have an element of protection because a greater proportion of their international revenues are in smaller markets where the LCCs should not be a factor.

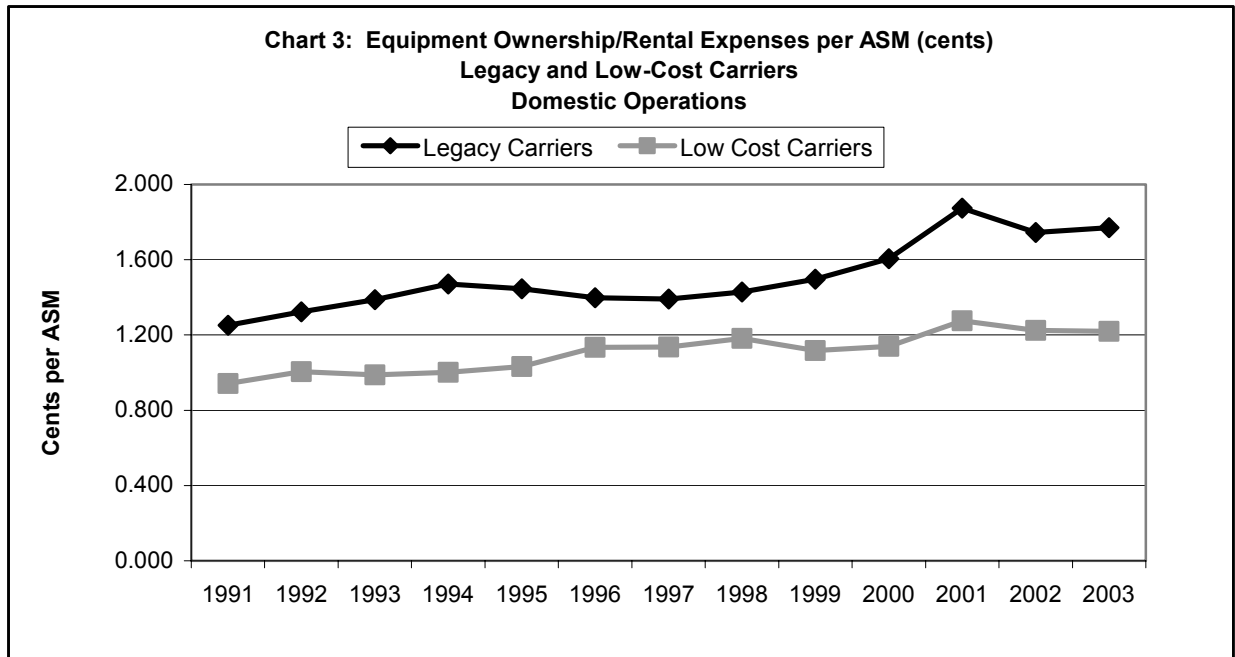
Chart 1: Unit Revenues and Costs per ASM (\$)
Excluding Transport Related Revenues and Expenses
Legacy and Low Cost Carriers*
Domestic Operations, 12 Months Ended Data



The next three charts compare LCC and legacy airline cost per ASM for the three largest individual cost centers—salaries and benefits, equipment, and fuel. Although LCCs have lower operating expenses in most categories, lower labor costs represent half of the total cost difference between the two types of carriers. This is more than proportional to labor’s share of average costs. Recently, the gap between labor unit costs has narrowed slightly after two successive periods during which the gap widened, as shown in Chart 2. Nonetheless, labor expenses still represent the largest individual component of total operating expenses for both the legacy and low-cost carriers.

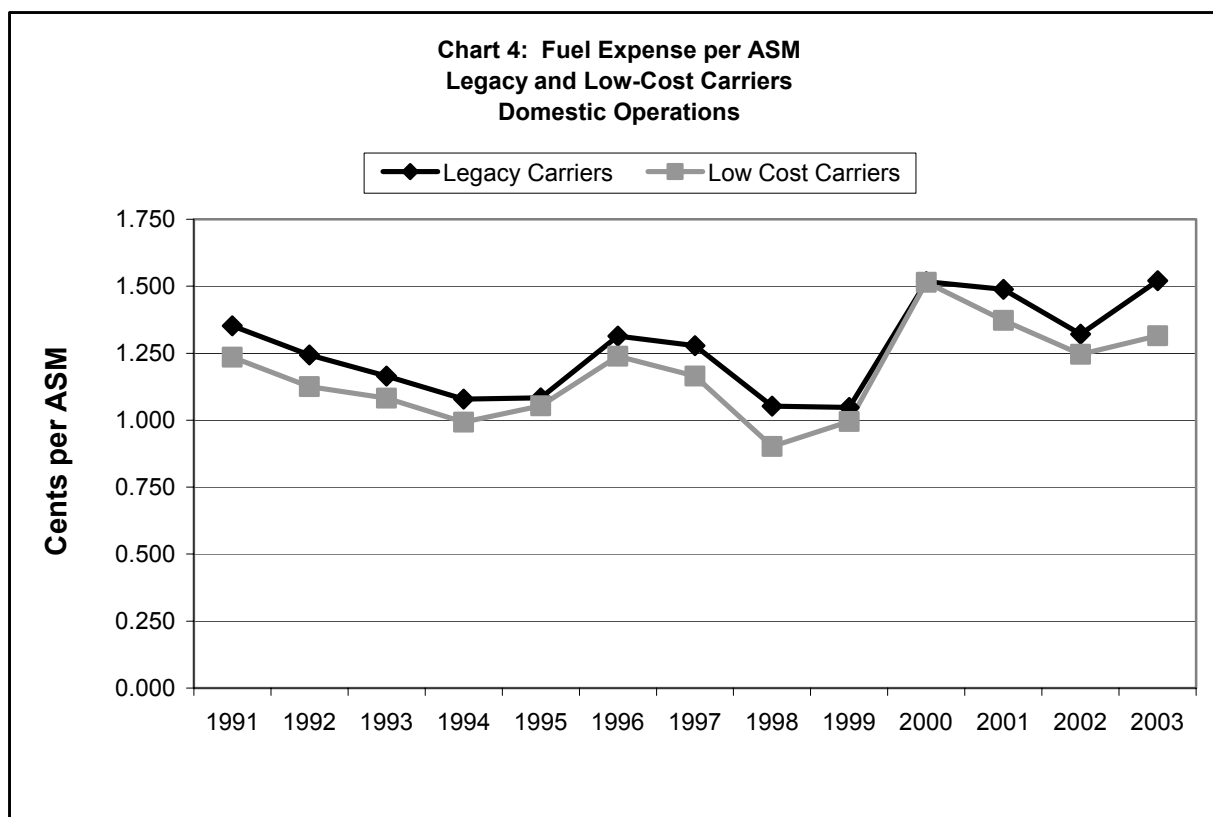


Source: DOT Form 41 Reports



Source: DOT Form 41 Reports

LCC equipment expense per ASM has been consistently below the level of the legacy carriers (Chart 3). This reflects the LCC practice of using each aircraft for more flights per day than legacy carriers do with their fleet, therefore spreading the same lease or ownership payments out over more passenger ASMs. The gap between the two carrier groups narrowed during 1996–1998 and then widened again. Rising costs in 2000 and 2001 may in part reflect the replacement by legacy carriers and LCCs of older aircraft such as 727s, DC-9s, and older 737s (which often were owned or inexpensively leased by the airlines) with newer A320s and 737s. Lower equipment costs per ASM after 2001 coincide with retirements of existing aircraft to reduce capacity, deferred deliveries of new aircraft, and renegotiation of leases and aircraft mortgages by carriers in, or near, bankruptcy.



Source: DOT Form 41 Reports

As shown in Chart 4, aircraft fuel expense per ASM for the legacy carriers is slightly above the level of expense for the low-cost carriers, although there is very little difference between the carrier groups during 1991–2003. Apart from the ability to hedge fuel expenses, the airlines have little control over the basic cost of fuel—hence, the relatively little difference between the carrier groups. Volatile fuel prices have a significant impact on LCCs and legacy airlines. According to one estimate, every one-dollar-increase in the price of a barrel of oil costs the U.S. airline industry \$450 million in pre-tax profits.²⁵ The cost per barrel of oil in 2003 was approximately \$30, and increased nearly 25 percent in 2004 to around \$37 per barrel.²⁶ The price per barrel of oil in mid-March 2005 is \$57. Some LCCs had extensive fuel-hedge contracts in place over the last two years that enabled those airlines to be less impacted by soaring fuel prices. In fact, Southwest Airlines estimates that its fuel-hedging program saved the airline more

²⁵ “Airline Industry Update”, Michael Linenberg, Merrill Lynch, March 18, 2005.

²⁶ Source: “West Texas Intermediate Crude Oil, New York (NYMEX) Spot Prices,” Energy Information Agency, U.S. Department of Energy (average of 12 months ended September 30 of each year).

than \$450 million in 2004; without it, Southwest would have lost money in three of the eight quarters during 2003–2004.²⁷

3.c. Conclusions

The relative operating cost structure of U.S. airlines has not changed much over time, even when accounting for the significant growth in the low-cost carrier market segment. Labor, fuel and equipment expenses still make up about two thirds of total average operating costs for U.S. airlines. However, U.S. LCCs have much lower average costs than legacy carriers in most categories. The future market presence of legacy carriers will depend significantly upon their ability to reduce costs and adjust to new market dynamics.

In the near term, the growing market presence of LCCs likely will continue to be replicated in other countries outside of the United States. LCCs around the world will continue to dominate aircraft and related equipment purchase trends as they increase their levels of service and expand their operating fleets with new aircraft. U.S. and European manufacturers will continue to compete fiercely for large orders from this relatively small number of airlines.

Changes in service spawned by deregulation have directly impacted the aircraft manufacturing industry. The anticipated tendency to use larger aircraft, particularly on hub-to-hub routes or other dense city pairs, did not come into practice on domestic flights due to the business model employed by network airlines. Their basic strategy was to focus on time-sensitive business travelers as a means to achieve high average fares in order to cover their high average costs. They did not want to schedule capacity to accommodate lower-fare discretionary passengers because that would have been inconsistent with their purpose of maintaining high average fares.

Widebody aircraft have to date had a lesser role in serving solely U.S. domestic routes than was true at the end of deregulation when the large airlines operated point-to-point systems of service. Widebody planes were used for around 4 percent of nonstop passenger departures within the continental United States (CONUS) in June of 1988, when they accounted for 30,867 of a total 717,278 departures.²⁸ This percentage declined steadily to only 1.7 percent of CONUS departures in June 2004 (accounting for 14,147 of a total 808,522 departures).²⁹

The resulting use of smaller aircraft served multiple purposes. First, business travelers wanted the convenience of frequency. In any given market, the carrier that offered the most frequency, all else equal, had a decided advantage in attracting the time-sensitive traveler. Second, smaller aircraft allowed the airlines to accomplish this while, at the same time, constraining capacity for lower-fare passengers.

²⁷ “Southwest Posts Profit, Thank to Fuel Hedging,” *Aviation Daily*, January 20, 2005; “Dressed to Kill...Competitors: Southwest’s new boss is taking aggressive steps to boost capacity and profits,” *Business Week*, February 21, 2005.

²⁸ U.S. Department of Transportation and OAG Worldwide Ltd. data on scheduled service, nonstop passenger departures within the continental 48 United States by aircraft group for the month of June, various years.

²⁹ *Ibid.*

The shift to smaller aircraft has been aided with the introduction of new models of 100- to 200-seat passenger aircraft with significantly expanded range over previous models. For example, the newest Boeing 737 and Airbus A320 families can be used for nonstop coast-to-coast U.S. domestic flights in regular passenger service.

A new generation of regional jets also has helped to meet this demand for smaller aircraft. In recent years there has been a virtual explosion of RJ service in the United States. In 1993, RJs made up less than 1.5 percent of U.S. fleet domestic operations (11,280 out of 762,833 nonstop passenger departures within the continental United States in June.)³⁰ This percentage grew to 10 percent by June 2000 (85,361 out of 822,842 departures), and to 30 percent in June 2004 (242,096 out of 808,522 departures).³¹ Some RJs served new markets and some replaced small turboprop aircraft, but many replaced larger aircraft as well. In large numbers of city-pair markets this has simultaneously resulted in more frequency but fewer seats. Both results typically bring higher yields to the airlines, although specific yields in certain markets can be difficult to discern due to the impact of agreements between the mainline carriers and their regional affiliate airlines. On a unit basis RJs are more expensive to operate, and it is unclear whether the airlines have been able to maintain yields high enough to offset their higher unit costs in the long run.

The trend toward smaller aircraft has been noticeable on international routes as well. For example, Boeing's 747—the largest commercial aircraft in service—has been replaced on many trans-oceanic routes by smaller twin-aisle long-range aircraft like the 767 and 777 (or Airbus A330/A340). Smaller capacity 757 and even 737 aircraft have been used in limited instances to service transatlantic flights in recent years. This shift has had a noticeable impact on the mix of aircraft rolling off the production line. For example, production of 747s has dropped from a high of five or six a month around 1980 and again in the early 1990s to only 19 in all of 2003.³²

³⁰ Ibid.

³¹ Ibid.

³² *U.S. Civil Jet Transport Shipments 1971–2003*, Aerospace Industries Association Data Series 21, April 21, 2004.

Chapter 4 – Prime Manufacturers – Concentrated Leadership

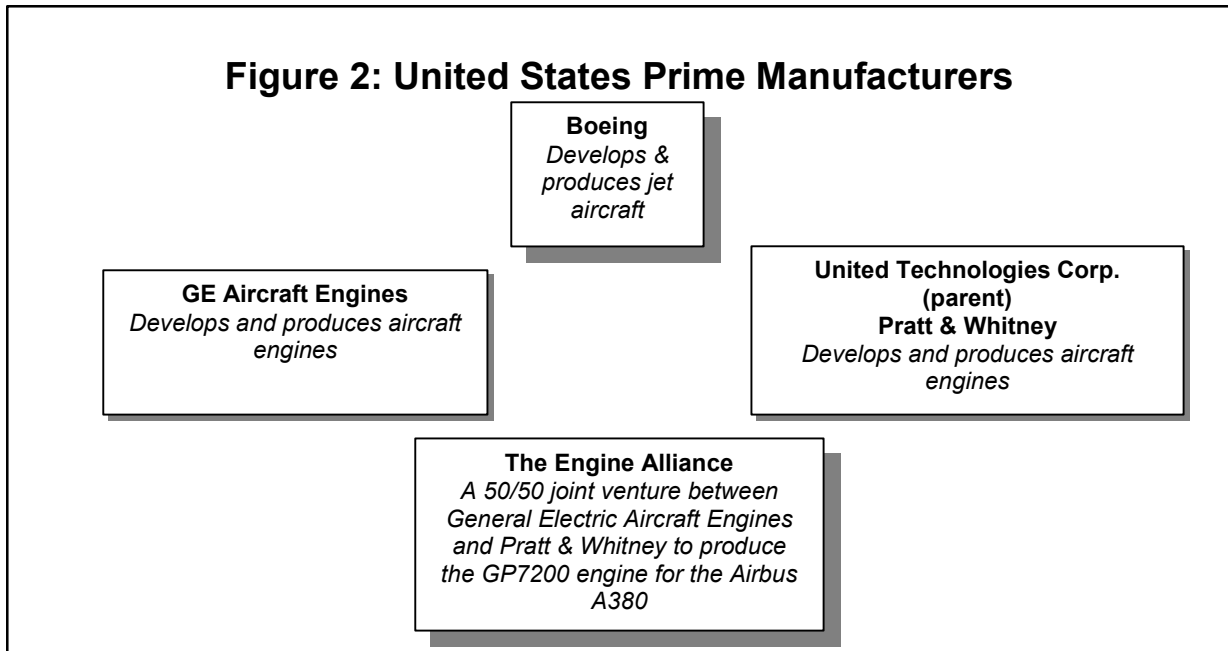
The global commercial aerospace industry can be viewed in categories of companies or tiers. This analysis focuses on companies that are either primarily or significantly involved in the production of large civil aircraft (LCA) with 100 or more seats. Aerospace LCA manufacturing is dominated by companies in a few countries, namely the United States, Europe (Germany, France, United Kingdom, Italy, Spain), Brazil, Canada, Japan, China, South Korea and Russia.

This report categorizes companies that develop and produce complete aircraft and aircraft engines as prime manufacturers. A limited number of companies dominate this segment of the market globally. All of these companies manufacture civil and military aerospace products. Corporate ownership and final assembly historically have been (and largely continue to be) geographically concentrated (e.g. in one country such as the United States or a small number of countries such as France, Germany, and the United Kingdom). Traditionally, these companies would have full responsibility for design and production of complete aircraft and engines. They would rely on a great number of suppliers, including wholly owned subsidiaries as well as other suppliers that would manufacture parts according to design specifications provided by the prime.

Prime manufacturers no longer bear the burden of design and production of new products alone. Instead, they increasingly are becoming systems integrators. Given the complex nature of the final products and the significant number of components in an aircraft, systems engineering always has been central to the design and manufacture of aircraft. New design tools enable collaboration across companies and around the world.

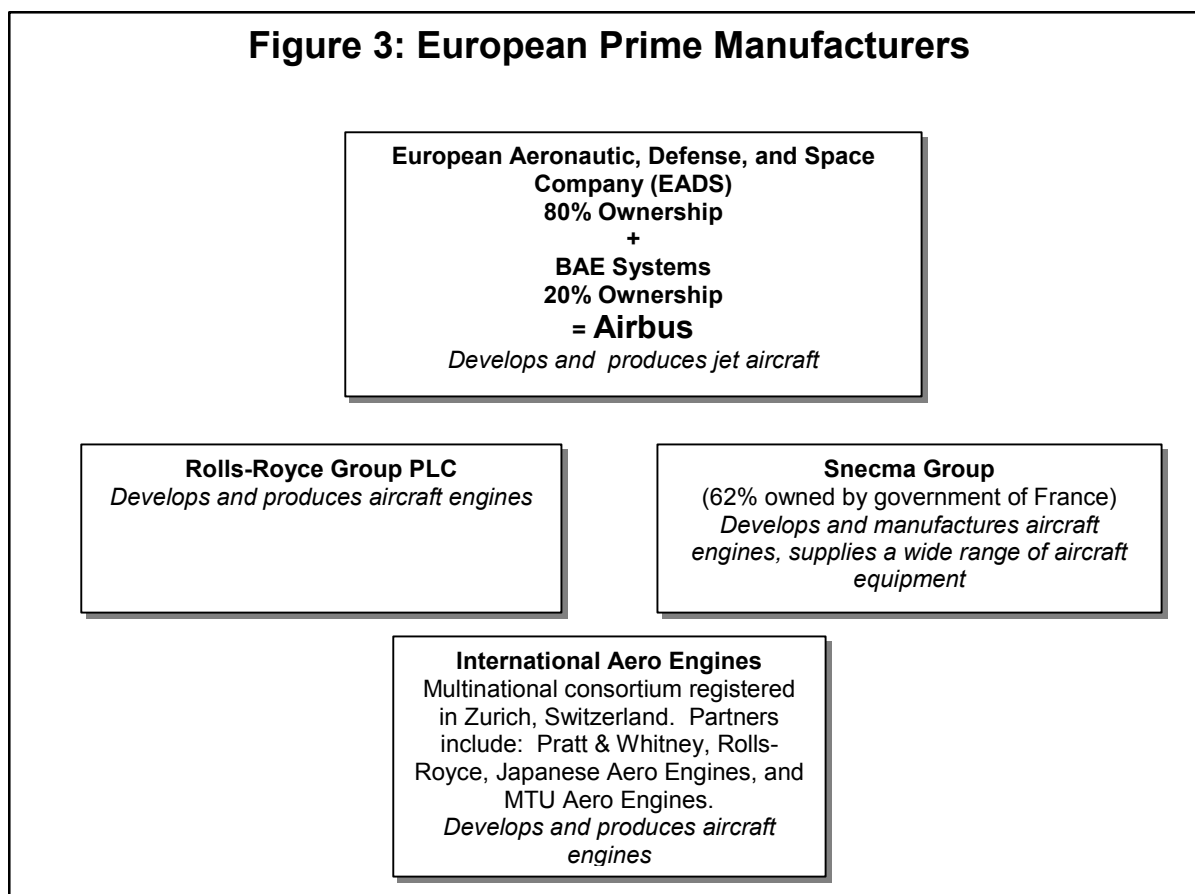
Prime manufacturers are increasingly looking to foreign partners as a growing source of investment capital for new projects. International risk-sharing partners are playing an increasing role in new aircraft and engine programs.

All U.S. prime manufacturers (Figure 2) have broadly distributed production across the United States and around the world. All rely on international suppliers and wholly owned subsidiaries in other countries. European prime manufacturers (Figure 3) have facilities across Europe, but are somewhat less broadly distributed outside of the European Union.



There has been significant consolidation among U.S. and European aerospace companies. U.S. companies have sought to diversify business lines. European companies have consolidated to establish a single national European champion in various market segments, mostly under the umbrella of EADS.

Figure 3: European Prime Manufacturers



One distinguishing characteristic of some European prime manufacturers is the greater degree of government ownership or control by national authorities. The U.S. government does not own any of the U.S. LCA manufacturers, although it does have some oversight of non-U.S. investment in U.S. companies. Under the provisions of the Exon-Florio amendment to the Defense Production Act, companies are asked to voluntarily notify the U.S. government of pending or proposed investments with potential implications for U.S. national security. In addition, federal agencies can initiate the notification process that would start a formal review. The president has the power to block or dissolve such transactions if there is credible evidence that the investment threatens to impair the national security and there are no other authorities available to the president to mitigate identified national security concerns.

The President delegated his authority to conduct reviews and investigations specified in the Exon-Florio legislation to the interagency Committee on Foreign Investment in the United States (CFIUS). The CFIUS is chaired by the Treasury Department and its membership includes the Departments of Commerce, Defense, Homeland Security, Justice, and State, the Office of the U.S. Trade Representative, the Office of Management and Budget, the Council of Economic Advisers and other White House offices. Foreign investors have acquired or invested in numerous U.S. aerospace manufacturers following CFIUS reviews, however. One example in the aerospace sector is Rolls-Royce PLC's acquisition of U.S. aircraft engine manufacturer Allison Engines in 1995; as a result of the acquisition, approximately 25 percent of the U.S.

Defense Department's (DOD) aircraft fleet is powered by Rolls-Royce engines, and the DOD is the largest single customer of Rolls-Royce military engines.³³

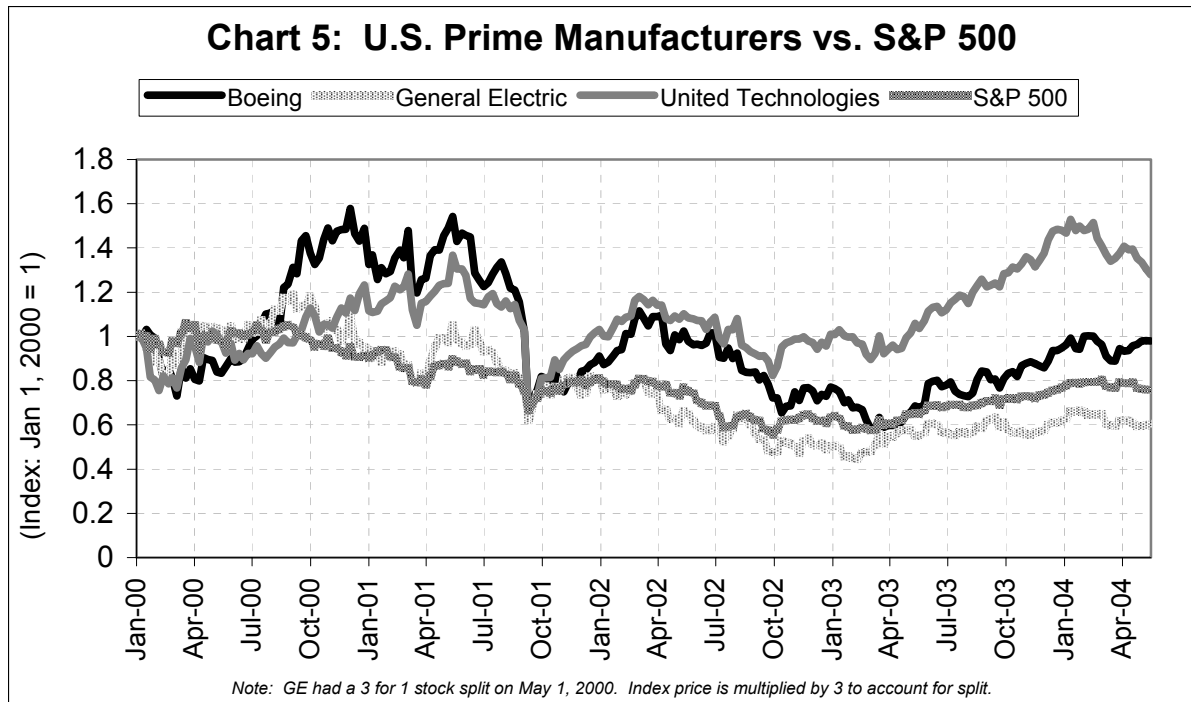
In contrast, the French government maintains a 15 percent direct ownership stake in EADS. The French government's 62 percent stake in SNECMA gives it even more control over the company. Some European companies such as Rolls-Royce were previously government-owned but subsequently were privatized. However, the U.K. Government has maintained "golden shares" in BAE Systems and Rolls-Royce PLC, a way for the government to maintain a degree of control over privately held strategic industries that conduct business in sensitive sectors, primarily defense-related. Through the golden share, the U.K. government has imposed limits on foreign ownership on Rolls-Royce and BAE Systems (and other privately held companies) through clauses in their articles of association. In 2002, the U.K. government lowered these foreign investment restrictions from 49.5 percent to 15 percent.³⁴ In addition, restrictions on the nationality of board members were relaxed and the requirement for the chairman to be British was removed. However, since the European Court of Justice struck down the golden share arrangements in British Airports Authority in 2003, it is anticipated that there will be future modifications to other golden share arrangements.³⁵

Differences in financial performance also exist between U.S. and European primes. While the commercial aerospace industry is known for being notoriously cyclical, the U.S. prime manufacturers are sound financially. As indicated in Chart 5, U.S. prime manufacturers have generally outperformed the S&P 500 in recent years. U.S. primes are publicly traded, and are rated as investment grade by the major credit rating agencies, meaning that they are sound enough to attract institutional investors because of low risk, thereby reducing their overall cost of capital.

³³ Briefing by Rolls-Royce executives to the Commerce Department, April 29, 2002.

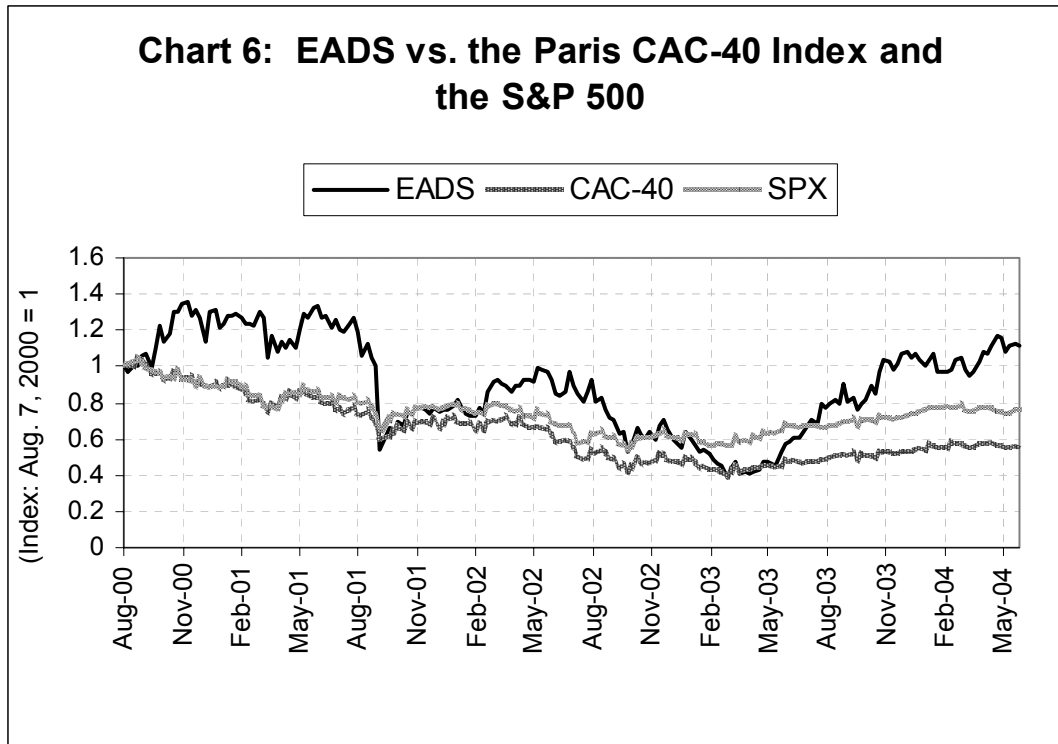
³⁴ The Economist Intelligence Unit, U.K.: Forex Regulations, November 25, 2003.

³⁵ The Economist Intelligence Unit, U.K.: Forex Regulations, August 18, 2004.



Source: Yahoo Finance

As shown in Chart 6, the financial position of European primes is more difficult to assess given the limited or inconsistent financial information available for them due to partial private and government ownership. According to the data that are available, EADS suffered an average two-year sales growth of -1.07 percent in 2001–2002, reporting negative \$299 million net income in 2002. Nonetheless, its stock has counter-intuitively outperformed the S&P 500 and the Paris CAC-40 Index.



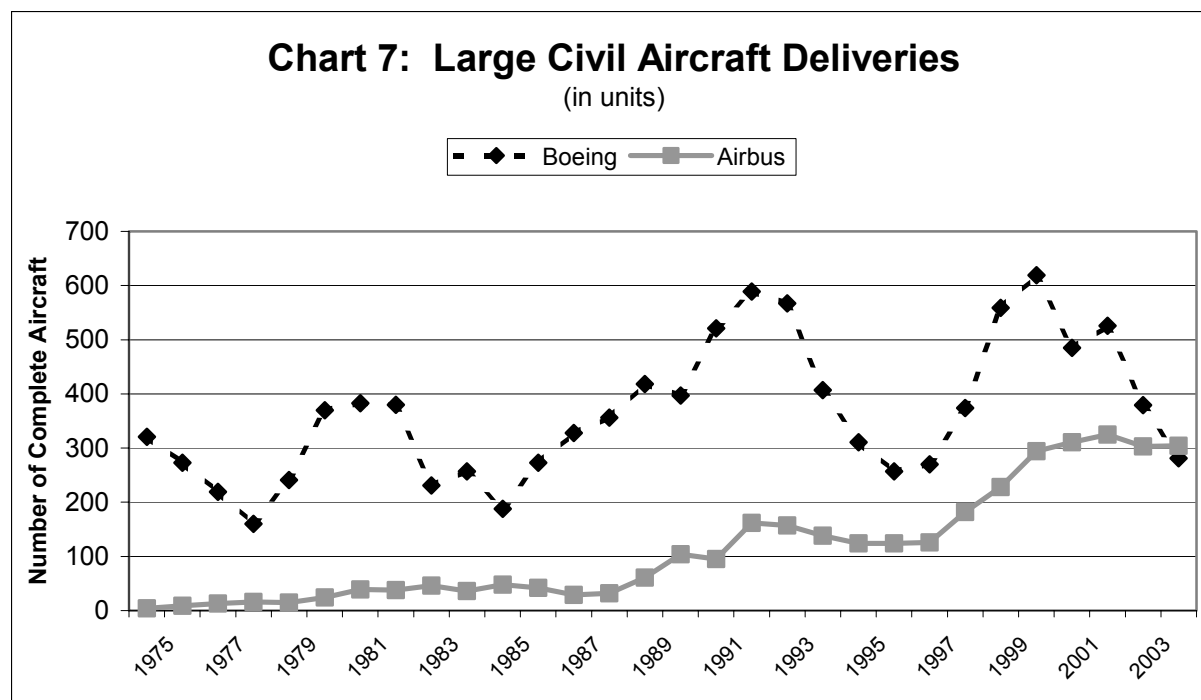
Source: Yahoo Finance

4.a. Large Civil Aircraft (LCA)

Two manufacturers now dominate global production of large civil aircraft: Boeing (United States) and Airbus (European Union). Boeing and Airbus offer largely similar product lines in terms of size categories, range, and cost. Each new generation of aircraft from Boeing and Airbus has been introduced with new innovations, and there are some differences in how each company's aircraft are manufactured and operated. For example, Boeing traditionally undertakes the majority of production of an aircraft at a single facility, whereas Airbus transports large subassemblies from various factories for final assembly. Each company uses a variety of materials in each of their aircraft models, ranging from metals such as aluminum and titanium to structures of molded-carbon composite. Boeing aircraft designs are based on hydraulic and mechanical flight controls, and each Boeing aircraft model cockpit design is different. In contrast, most Airbus aircraft are fitted with fly-by-wire controls (e.g. computer-based controls) enabling Airbus to offer a largely common cockpit design across all Airbus models. Nonetheless, basic overall aircraft design has not changed radically since Airbus entered the market 30 years ago.

What has changed dramatically over the last 30 years is the competitive position of these two companies. Starting in 1974 with the first delivery of an Airbus A300, Airbus has steadily increased production and share of the global operating fleet. As shown in Chart 7, Boeing's dominant market position as measured in deliveries of aircraft has slowly been eroded since Airbus began selling aircraft. In 1974, Boeing and McDonnell Douglas together produced 321

aircraft when the first four A300s rolled off the assembly line. Production by U.S. and European companies climbed dramatically over the next 15 years, more than doubling by 1991. Nonetheless, Boeing (and McDonnell Douglas) still produced more than eight out of every 10 large civil aircraft in Western markets in 1991.



Source: U.S. Department of Commerce analysis of Boeing, Airbus data

Boeing annual deliveries dropped by half over the next five years, only to return to record production numbers again in 1999. However, Airbus's weaker position enabled it to avoid the massive drawdown in production experienced by Boeing through the early 1990s and thereby close the gap in deliveries. When Boeing deliveries again dropped dramatically following September 11, 2001, it had to reduce excess manufacturing capacity, leading it to consolidate production facilities and lay off tens of thousands of employees.

This drop in deliveries came just as Airbus was starting to ramp up production, so Airbus was able to maintain relatively stable production levels. Instead of scaling back on deliveries, Airbus postponed expansion of production facilities and its European work force following September 11, 2001. In 2002, Airbus for the first time delivered more commercial aircraft than Boeing.

The last 15 years have seen the almost complete disappearance of the only other first-tier large commercial aircraft manufacturing sector in the world: Russia. At the time of the collapse of the former Soviet Union in 1990, Russian aircraft manufacturers were producing 500 civil aircraft a year (although only around 40 in the large civil aircraft category³⁶).

³⁶ *Global Competitiveness of U.S. Advanced-Technology Manufacturing Industries: Large Civil Aircraft*, Investigation No. 332-332, Publication 2667, U.S. International Trade Commission, August 1993.

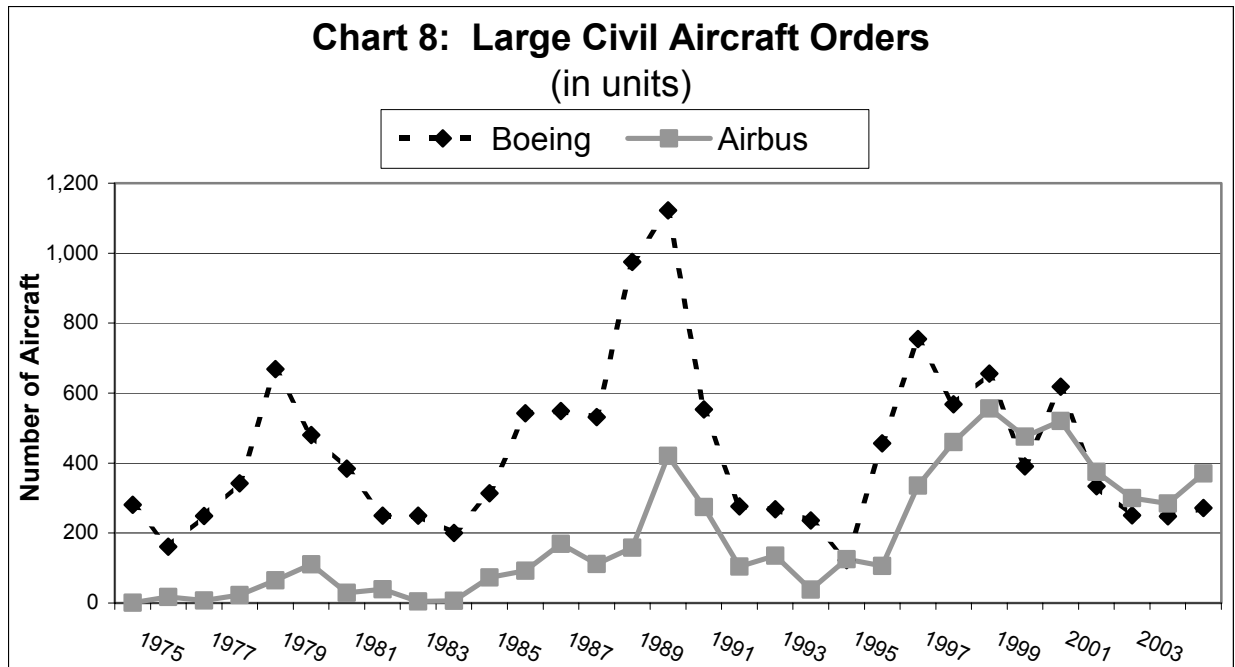
Today, only a handful of the 300 remaining Russian aerospace design bureaus, manufacturing plants, and research institutes are profitable, while most others struggle with severe reductions in government procurement and research and development funding, which is about 7.5 percent of Soviet Union levels. Most of the limited current aerospace production relates now to completing military aircraft, engines, and parts as well as space launch vehicles. Russian production of commercial aircraft has nearly disappeared, with only four aircraft produced in 2000.³⁷

U.S. and European manufacturers did not experience an increase in production to offset plummeting Russian production, largely because the traditional operators of Russian aircraft collapsed along with the former Soviet manufacturing industry. Even as recently as 2002, Russian airlines owned three to four times as many aircraft as required to service their current routes, although many of those aircraft were at or near the end of their operational lives.³⁸ The high relative cost of Western aircraft, the absence of established maintenance and support networks for those aircraft, and restrictive import policies such as excessive import tariffs on large civil aircraft intended to protect the domestic manufacturing industry also contributed to limited sales to Russia over the last 15 years.

Civil aircraft purchases understandably tend to be closely tied to the economic health of the airlines and the economy generally. Total industry orders and deliveries dropped following the high fuel prices in the 1970s and again in the early 1980s. Rapid growth in the mid-1980s of the airline industry yielded a corresponding spike in civil aircraft deliveries and orders, culminating in a record announcement of 1,543 aircraft ordered in 1989. Deliveries for both companies dropped dramatically in 1991 at the advent of the first Gulf War, and did not recover until the mid-1990s.

³⁷ *Industry Sector Analysis on the Russian Aerospace Sector*, U.S. Department of Commerce, 2002.

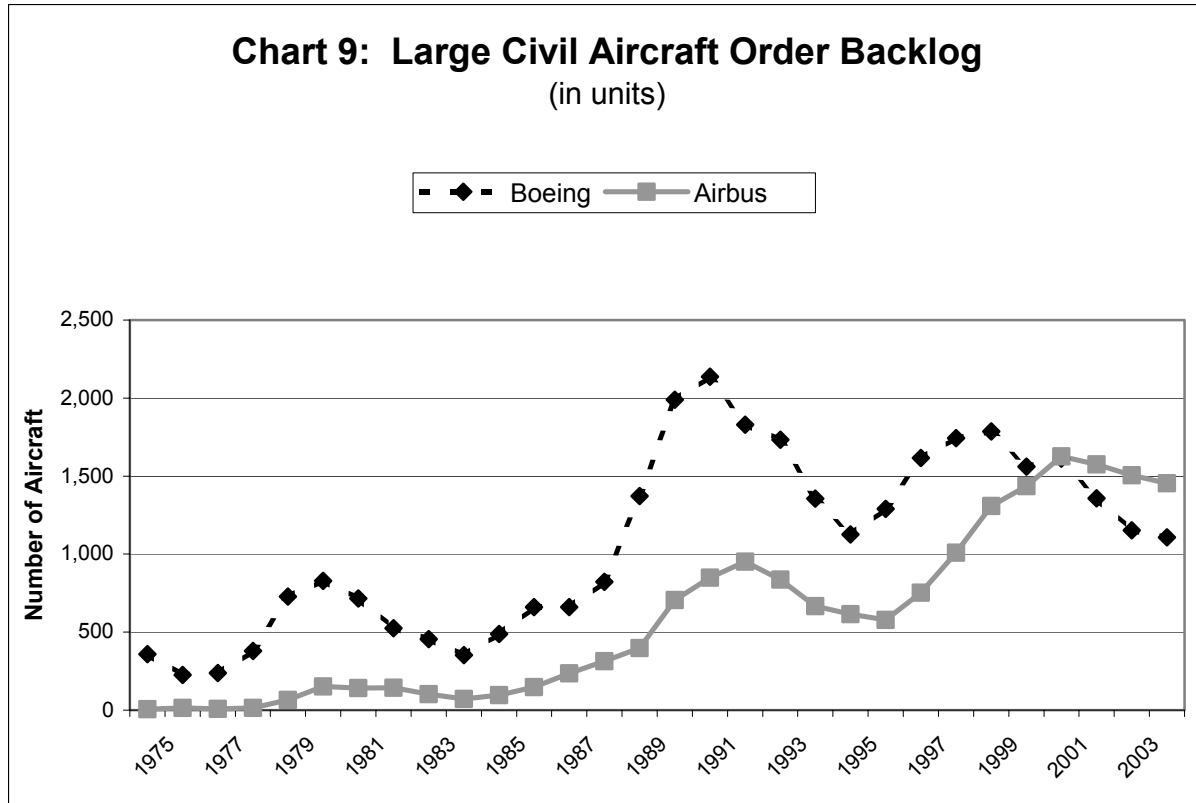
³⁸ *Ibid.*



Source: U.S. Department of Commerce analysis of Boeing, Airbus data

In 1999, Airbus for the first time announced more new aircraft orders than Boeing, shown in Chart 8. Boeing briefly regained the lead in orders in 2000, but Airbus has announced more orders than Boeing every year since 2001. Both companies have seen a rapid dropoff in new orders and rescheduling of existing orders as airlines struggled with the aftereffects of September 11, 2001, SARS, and a troubled global economy.

When comparing the future market position of Boeing and Airbus, it is instructive to look at the backlog of aircraft on order with each manufacturer, as shown in Chart 9. The backlog is the cumulative number of aircraft a manufacturer has on order at any given time.



Source: U.S. Department of Commerce analysis of Boeing, Airbus data

Boeing

Boeing's declining percentage of global sales should not overshadow its tremendous American footprint. Final assembly of Boeing commercial aircraft is concentrated in three facilities. However, Boeing reports that it has offices and plants in 27 states, and employs over 150,000 workers in 48 states. In 2003, Boeing paid approximately \$24 billion to more than 32,000 businesses in the United States, including production suppliers, non-production vendors, and subsidiaries of companies to which Boeing made other payments.³⁹

Major assembly sites for large commercial aircraft include:

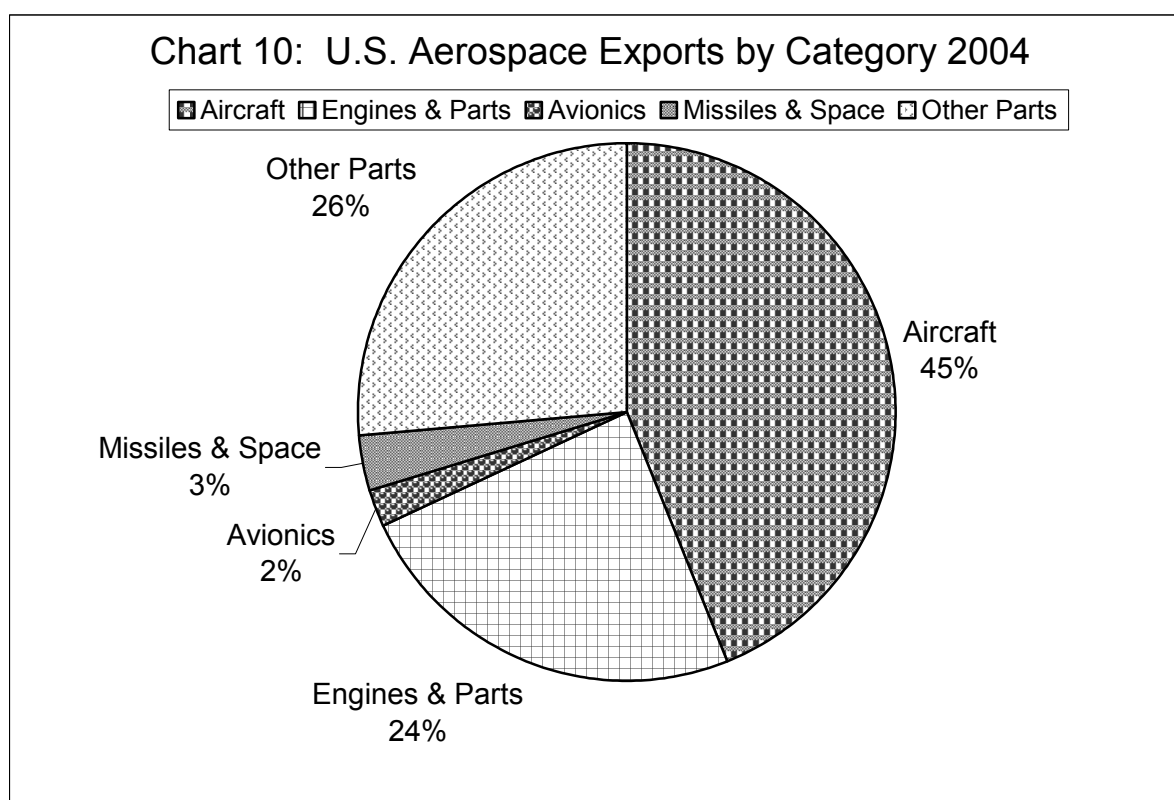
- Everett, Wash. 747, 767, 777 manufacturing
- Renton, Wash. 737 manufacturing
- Long Beach, Calif. 717 manufacturing (to be closed in 2006)⁴⁰
- Wichita, Kan. parts for all models except 717 (including 75 percent of the 737)

³⁹ *Boeing in the States 2004*, The Boeing Company.

⁴⁰ "Boeing to Recognize Charges for USAF 767 Tanker Costs and Conclusion of 717 Production", January 14, 2005. www.boeing.com/news/releases/2005/q1/nr_050114a.html

Nearly half of Boeing's annual revenues are attributed to commercial airplane sales, equal to \$22.4 billion in 2003.⁴¹ This share has declined in recent years in comparison to other Boeing business units such as helicopters, space and various military programs (which are primarily aerospace-related). Around a third of Boeing's total U.S. employees work for the commercial airplane division. However, the dramatic reduction in deliveries following September 11 has sharply reduced Boeing's commercial airplane workforce. Boeing has laid off nearly 35,000 employees of the commercial aircraft division since then.⁴² Nonetheless, commercial airplane sales account for a disproportionately higher percentage of overall Boeing corporate revenues.

International markets are critical for Boeing which exports three of every four commercial aircraft it produces. The reliance on international markets has grown in the last three years as U.S. carriers struggled to reorganize and avoid bankruptcy, deferring orders and in some cases delaying deliveries. Boeing aircraft exports are the foundation of the U.S. trade surplus in aerospace products, which in turn has a significant impact on the overall U.S. trade balance. As shown in Chart 10, in 2004, U.S. exports of all aircraft totaled \$22.8 billion, compared to exports of aircraft engines and parts worth \$12.4 billion, exports of other aircraft parts worth \$13.6 billion, and exports of missiles and space equipment worth \$1.8 billion.



Source: U.S. Department of Commerce, Office of Aerospace and Automotive Industries

Boeing's manufacturing process is undergoing a radical change. Boeing is changing its business strategy to focus on high-margin business elements—integration and systems engineering—and

⁴¹ Boeing SEC Form: 10-K, 2003

⁴² "Boeing's cuts today: 600 local workers," *Seattle Times*, July 18, 2003.

shedding some historical manufacturing activities thereby limiting the scope of its design work. Boeing even has announced plans to sell its manufacturing operation in Wichita, Kansas, a key facility for a number of Boeing aircraft programs.⁴³ It is taking advantage of reduced production rates by changing the way aircraft are assembled to make the process faster and more efficient. Boeing has introduced moving assembly lines for its 737 production line, and is introducing moving assembly lines for widebody aircraft produced at its Everett facility.

Development, manufacture, and assembly of Boeing's newest plane, the 787 (initially referred to as the 7E7), will be different from previous Boeing programs. Boeing is shifting responsibilities for component design to suppliers, and will focus on systems integration, managing overall requirements, and the assembly process. A significant number of 787 suppliers will be risk-sharing partners in the program, responsible for their own development and production costs and, in some instances, contribution of funds toward overall development and certification costs. Because the 787 will be assembled from large substructures designed and produced by suppliers, Boeing has stated that the 787 assembly plant will employ only between 800 and 1,200 workers, compared to 5,000 to 10,000 employees for previous Boeing aircraft programs.

Boeing also is relying more on foreign suppliers of equipment, components and even engineering services. This strategy reportedly is being used to drive down production and overhead costs, spread the risk associated with new aircraft programs, and in some cases in an effort to gain a foothold in important markets for new sales. Boeing directly produces parts in Canada and Australia, and relies heavily on suppliers of components and sub-assemblies from around the world, including Japan, China, Europe, and South America.

Foreign suppliers, especially the Japanese heavy industrial companies and the Italian company Alenia, are expected to play a significant role in the 787 program. Japanese industrial firms may produce as much as 35 percent of the 787 airframe, including the wing box.⁴⁴ Alenia has teamed up with the U.S. aerospace manufacturer Vought to produce 28 percent of the composite fuselage.⁴⁵ Chinese manufacturer AVIC I will produce the rudder.⁴⁶ Large aerospace companies in France, Germany, and the United Kingdom also are members of the Boeing 787 design team. In fact, if Boeing does sell the Wichita plant, the only parts of the 787 airframe made by Boeing will be the vertical fin of the tail made in Frederickson, Wash., and various fairings and flaps made by company units in Tulsa, Okla., Australia, and Canada.⁴⁷

Airbus

Airbus's current manufacturing processes are a result of its company heritage as a *groupement d'intérêt économique* (GIE). Production workshares were carefully allocated among facilities in the four partner countries according to the percentage of ownership in the company (France, 38

⁴³ "Boeing plant sale seen by year-end, but CEO says company has no plans to leave Wichita," *Bloomberg News*, September 25, 2004.

⁴⁴ "Groups move closer to Boeing 7E7 deal," *Financial Times*, October 20, 2004.

⁴⁵ "7E7 work might be headed south," *Seattle Post-Intelligencer*, November 3, 2004.

⁴⁶ "Chinese companies to make 7E7 parts," *Seattle Post-Intelligencer*, June 11, 2004.

⁴⁷ "Boeing names 7E7 suppliers; Goodrich the big winner," *Seattle Times*, April 16, 2004.

percent; Germany, 38 percent; United Kingdom, 20 percent; Spain, 4 percent).⁴⁸ Airbus changed from a GIE with the formation in 2000 of the European Aeronautic, Defense, and Space Company (EADS), the largest aerospace company in Europe (and second-largest European defense company). EADS combined the leading aerospace industry assets of France, Germany, and Spain, and became the parent company to Airbus with 80-percent ownership. BAE Systems PLC, the largest defense company in Europe (and second largest aerospace company in Europe), controls the other 20 percent of Airbus.

The Airbus manufacturing footprint is almost exclusively within EU borders, and mostly concentrated in the four Airbus member state countries (France, Germany, United Kingdom, and Spain). Large subassemblies are produced in different factories around Europe and transported to Toulouse, France, or Hamburg, Germany, for final assembly. Including the headquarters in the Netherlands, Airbus has facilities in five EU member states, and employs more than 101,000 workers throughout the European Union.

Major Airbus production facilities include:

- France Nante, Meaulte, St. Nazaire, Toulouse
- Germany Hamburg, Bremen, Nordenham, Varel, Laupheim, Stade, Buxtehude
- Spain Getare, Illescas, Puerto Real
- United Kingdom Filton, Broughton

Final Airbus assembly facilities are located in:

- Hamburg, Germany A318, A319, A321
- Toulouse, France A300/A310, A320, A330/A340, A380

Nearly half of EADS employees are involved in commercial aircraft production.⁴⁹ Only 12 percent of BAE Systems employees work in the commercial aerospace business group, although some staff allocated to other business groups may indirectly work on commercial aerospace-related activities (headquarters or international partnerships etc.).⁵⁰ Whereas EADS is not widely diversified outside of the aerospace sector, BAE Systems produces a wide range of military land vehicles, submarines, and ships.⁵¹

⁴⁸ A GIE is a type of joint venture that has a legal identity separate from its members and which has no fixed capital contribution requirements. Each partner operates under the law of the country in which it is incorporated, eliminating the need to manage conflicting national tax and legal structures. Like a partnership in the United States, a GIE is not required to report financial results or pay taxes on its profits unless it so elects. However, GIE partners must comply with their respective national legal and tax codes with respect to tax payments on overall corporate profits. Production as well as decision-making was distributed among GIE members. *Changing structure of the Global Large Civil Aircraft Industry and Market*, Investigation No. 332-384, Publication 3143, U.S. International Trade Commission, November 1998.

⁴⁹ EADS reference document, 2002, www.eads.net

⁵⁰ BAE Systems annual report, 2003, <http://ir.baesystems.com>

⁵¹ EADS financial statements, www.baesystems.com

Like Boeing, Airbus relies on global markets for a significant percentage of annual sales. In 2002, approximately 69 percent of Airbus aircraft were sold to airlines outside of the European Union. Europe also enjoys a significant trade surplus in aerospace products, thanks in large part to exports of large commercial aircraft. North America was the primary export market for Airbus, representing 37 percent of total 2002 sales, including direct exports and aircraft sold to leasing companies that were placed with U.S. airlines.⁵²

Airbus is not undergoing as significant a change in its manufacturing processes as Boeing in recent years. Because of its history as a GIE, Airbus had always based its manufacturing process on distributed production of large components with centralized final assembly. U.S. suppliers have participated at some level in almost all Airbus commercial aircraft programs, and aircraft engines produced in full or in part by U.S. companies are on all but one Airbus aircraft model (the A340-500, -600).⁵³

Airbus is increasing its reliance on foreign risk-sharing partners and suppliers, most dramatically for the A380 and proposed A350 projects. U.S. companies have been selected as major subcontractors on the A380, often displacing longtime European suppliers on previous Airbus models. The increasing reliance of Airbus on non-European suppliers is a welcome change to the extent that Airbus selects suppliers based on commercial factors instead of assignment of workshares or other political considerations. This transition will, we hope, continue Airbus's evolution toward a more commercially oriented company.

In spite of this increasing reliance on U.S. and other foreign suppliers, public claims by Airbus of U.S. content and U.S. jobs supported by Airbus commercial aircraft sales appear to be overstated. At the end of 2002, Airbus parent company EADS reported a U.S. workforce of 2,653 employees. Airbus also claims that as much as 50 percent of the content of Airbus aircraft is sourced from U.S. suppliers. However, a 2002 study conducted by the U.S. Department of Commerce was only able to identify 250 U.S. companies compared to the 800 U.S. suppliers claimed by Airbus. Similarly, the Commerce Department has been unable to verify Airbus claims of sustaining 100,000 U.S. jobs through commercial aircraft sales.⁵⁴

4.b. Regional Jets (RJs)

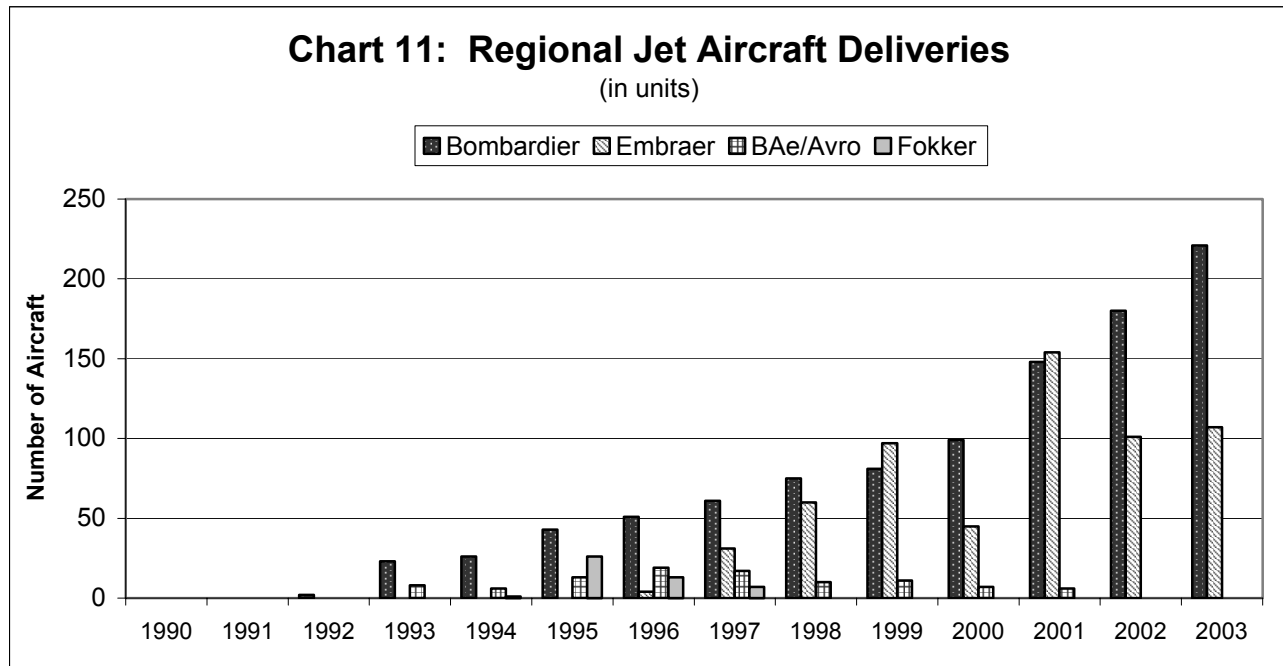
Similar to the large civil aircraft sector, global production of regional jets is dominated by two manufacturers: Bombardier (Canada) and Embraer (Brazil). As noted earlier, regional jets typically are considered to be commercial jet transport aircraft with fewer than 100 seats. Orders and deliveries of regional jets have grown rapidly over the last 10 years in particular as airlines look to use them to fill a unique market niche. Production of current-generation regional jets has jumped from two RJs delivered in 1992 to well over 300 delivered in 2003, as shown in Chart

⁵² EADS reference document, 2002, www.eads.net

⁵³ U.S. Department of Commerce, Office of Aerospace and Automotive Industries, analysis of aircraft-engine model data provided by aerospace manufacturers, June 2004.

⁵⁴ <http://murray.senate.gov/aerospace/Aldonas.pdf>

11.⁵⁵ The aerospace subsidiary of Bombardier is the third largest civil aircraft producer behind Boeing and Airbus, and the foremost global producer of regional aircraft, accounting for two thirds of global deliveries in 2003.

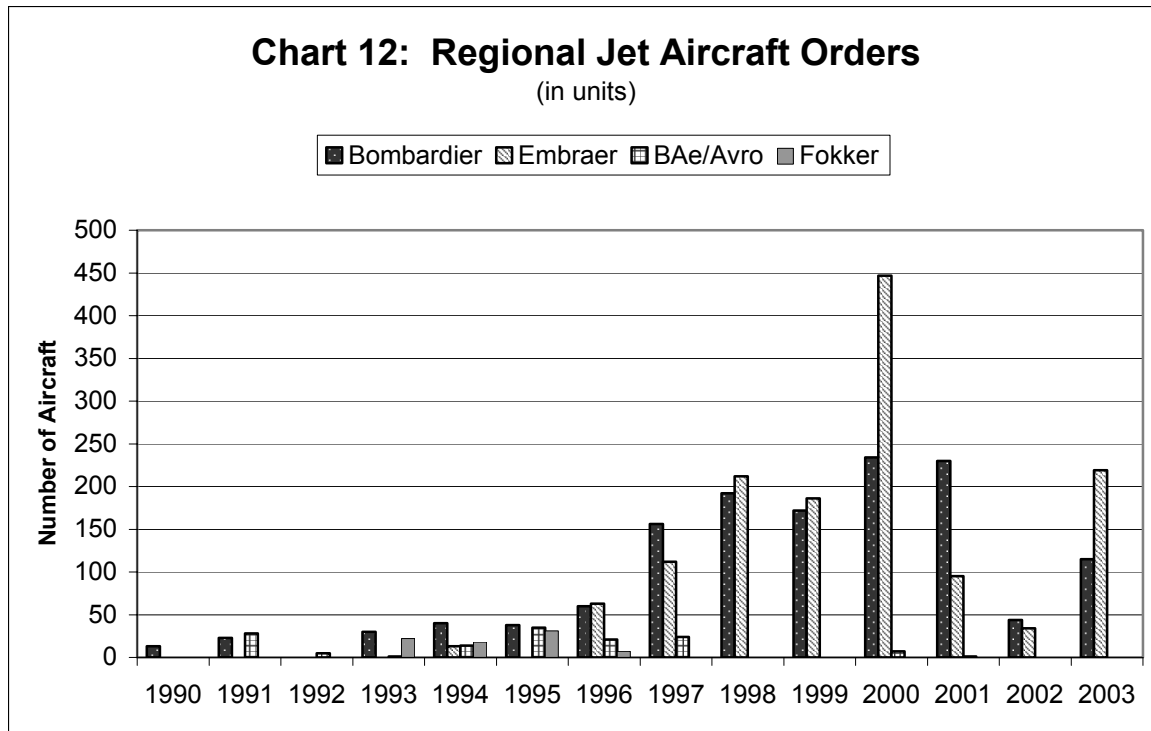


Source: U.S. Department of Commerce, *Speednews*

Together, Bombardier and Embraer have completely displaced European RJ manufacturers in the global market. Other producers of regional jets in recent years have exited the market. German company Fairchild/Dornier entered into bankruptcy, and sold the rights to its different aircraft programs to various investors in early 2003.⁵⁶ The only Fairchild/Dornier program to survive was the 32-passenger 328JET program purchased by AvCraft Aviation. The last British Aerospace regional jet rolled off the assembly line in 2001.

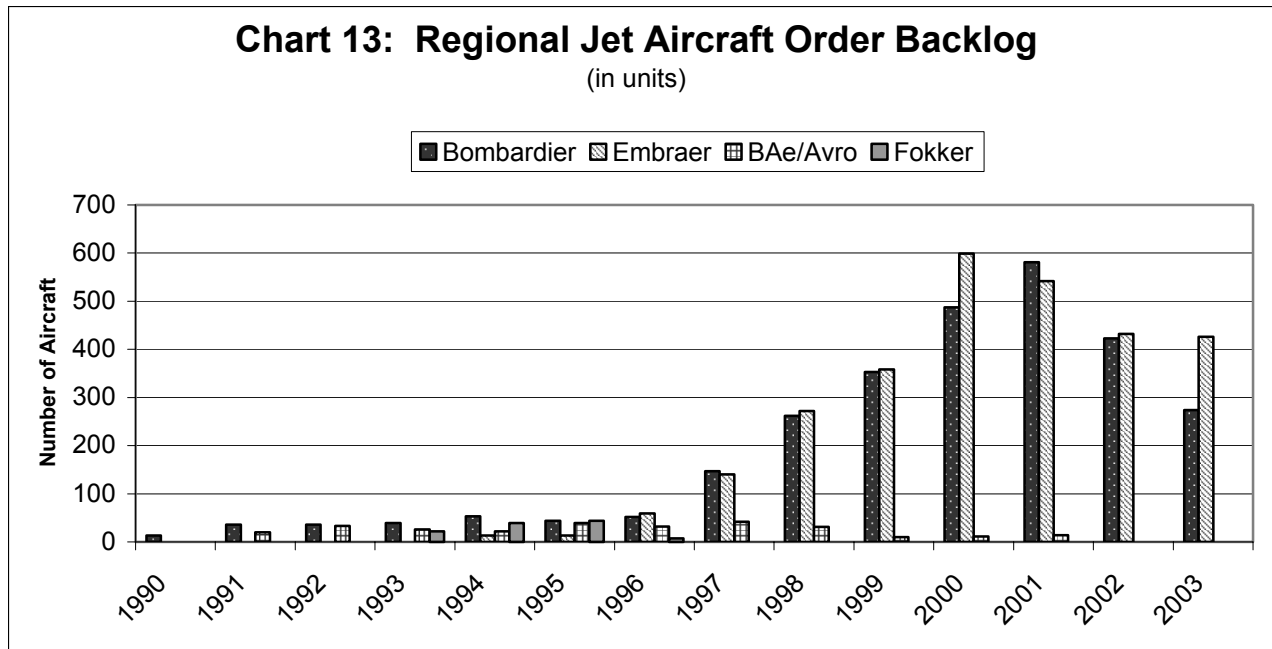
⁵⁵ U.S. Department of Commerce, Office of Aerospace and Automotive Industries, analysis of RJ data from *Speednews*, January 2005.

⁵⁶ "New Owner Expects to Begin Delivering 328Jets Within 60 Days," *The Weekly of Business Aviation*, March 31, 2003.



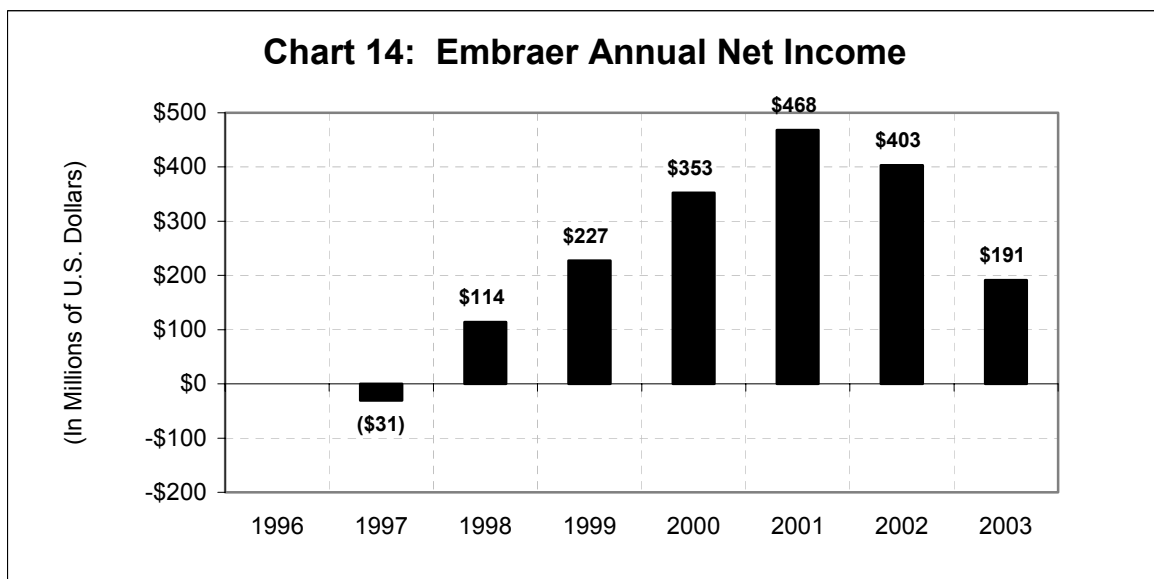
Source: U.S. Department of Commerce, *Speednews*

Bombardier has consistently increased annual deliveries of current generation RJs from two jets in 1992 to 221 jets in 2003, but has not dominated the market. As shown in Chart 11, Embraer delivered more RJs in 1999 (97 vs. 81 aircraft) and again in 2001 (154 vs. 148 aircraft). Embraer announced more orders for new aircraft than Bombardier in four of the last six years, as shown in Chart 12. Perhaps more importantly, Chart 13 shows that Embraer had a production backlog for RJs twenty percent greater than that of Bombardier at the end of 2003 (426 aircraft vs. 274 aircraft).

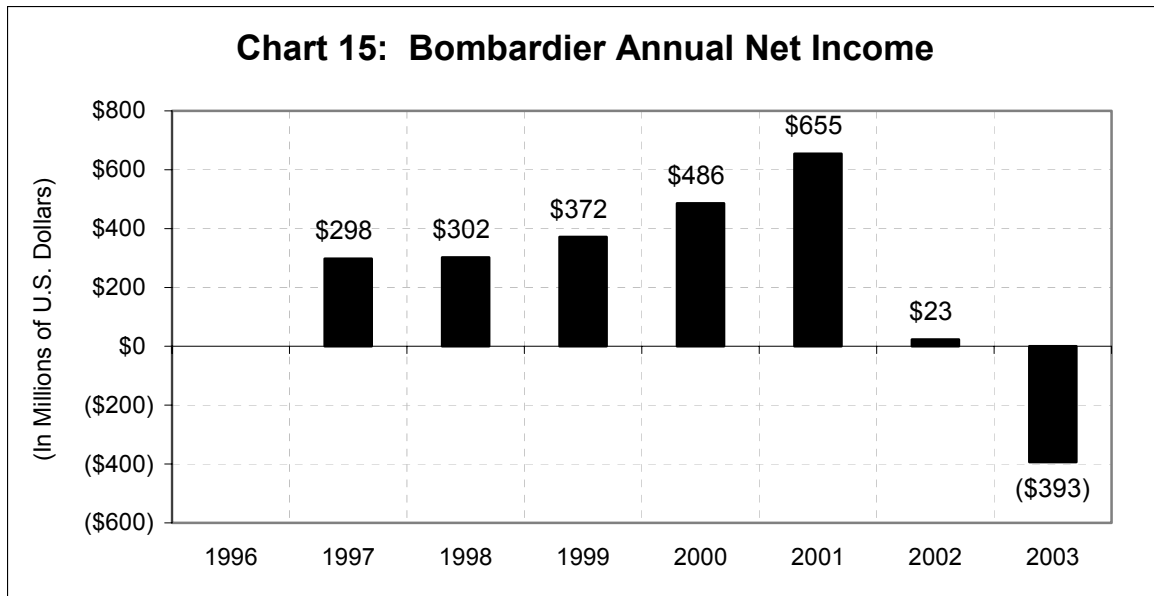


Source: U.S. Department of Commerce, *Speednews*

The financial performance of the regional jet manufacturers has been mixed. Embraer and Bombardier both experienced rising net income in the late 1990s as deliveries of regional jets grew, peaking in 2001. Embraer has successfully weathered the post-September 11 downturn with positive net earnings, shown in Chart 14. In contrast, Bombardier net income plunged by more than \$1 billion cumulatively between 2001 and 2003, shown in Chart 15.

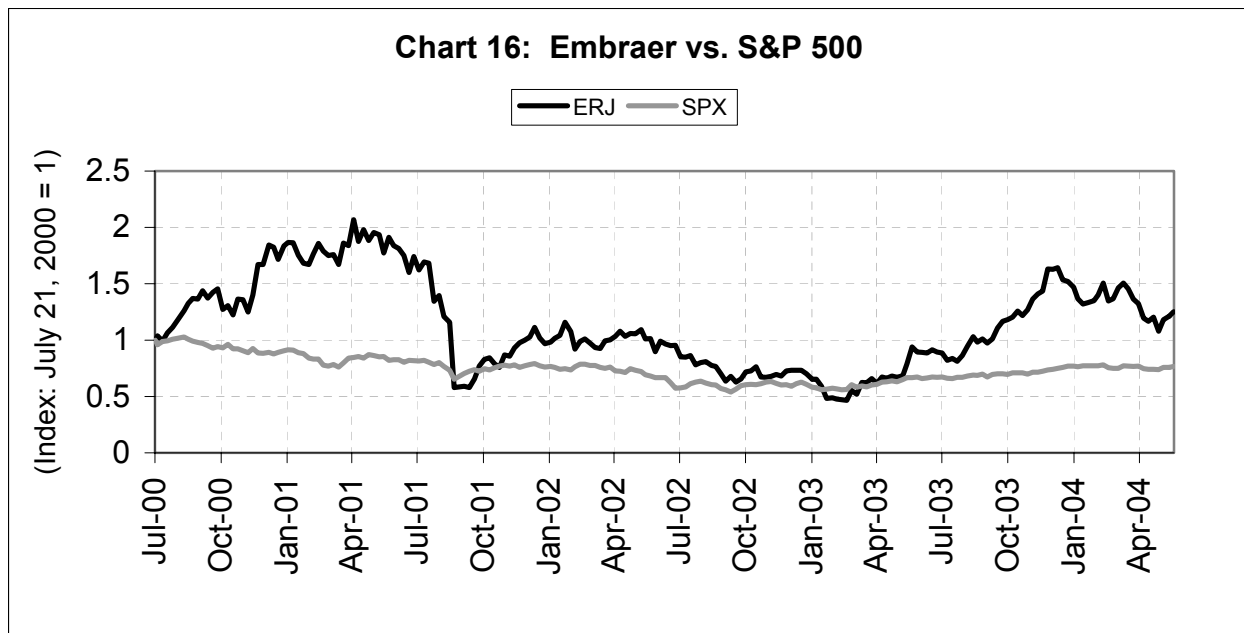


Source: Bloomberg Professional



Source: Bloomberg Professional

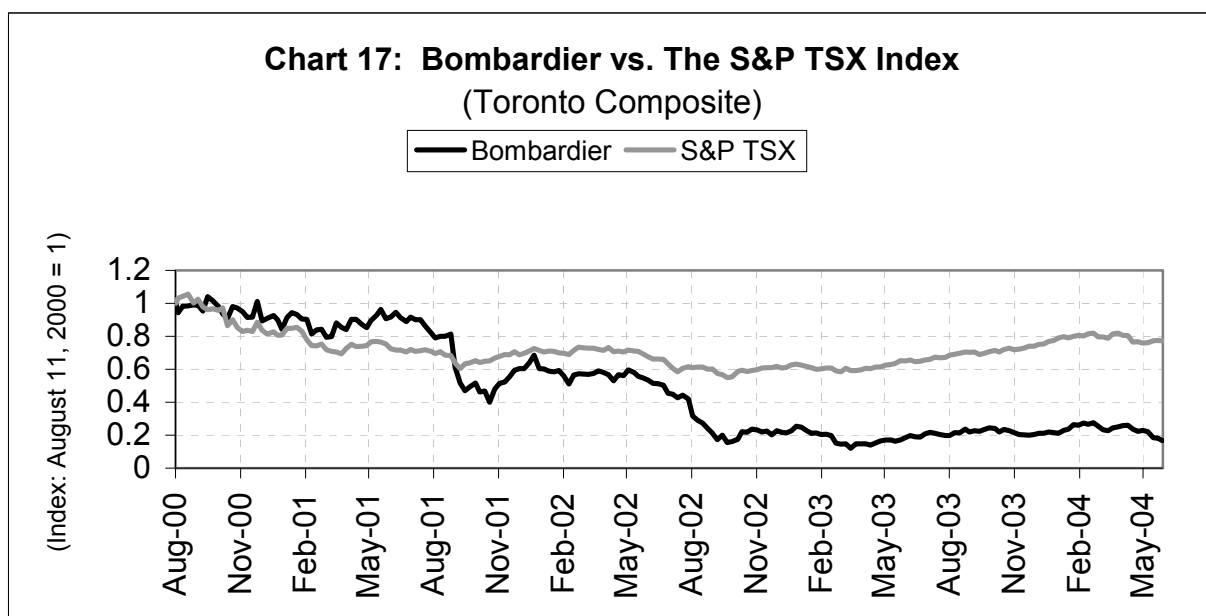
This performance is shadowed in the stock market. Embraer stock has consistently outperformed the S&P 500 over the last three years (Chart 16), whereas Bombardier's stock has performed increasingly poorly since mid-2001 in comparison with the Toronto Composite (S&P TSX Index) (Chart 17). Bombardier has an investment-grade credit rating by Standard & Poor's at BBB- (the lowest rating before non-investment grade).



Source: Yahoo Finance

The financial problems of United States–based RJ customers are having a direct financial impact on Embraer and Bombardier. For example, after US Airways filed for bankruptcy a second time in September 2004, Embraer announced that it was suspending deliveries of RJs to that carrier until it could determine U.S. Airways’ ability to pay for the airplanes. Press reports indicated that U.S. Airways at the time was committed to nearly \$1.5 billion worth of future deliveries from Embraer, calling into question the viability of Embraer’s future production targets.⁵⁷

The impact on Bombardier of poorly performing airlines has been even greater. Concerns about order delays and declining production, due in part to bankruptcy concerns about two key Bombardier RJ customers–Delta Airlines and U.S. Airways–led credit-rating agencies to downgrade Bombardier stock in late summer 2004.⁵⁸



Source: Yahoo Finance

Embraer

Embraer’s existing production and assembly facilities are concentrated in a large complex outside of San Jose dos Campos, Brazil, where a significant portion of Embraer’s 12,000-person Brazilian workforce is located. Like Boeing and Airbus, Embraer is not widely diversified outside of the aerospace sector, although it manufactures both civil and military aircraft and produces subassemblies and parts for other aircraft manufacturers.

⁵⁷ “Embraer halts US Airways delivery,” *Reuters*, September 16, 2004.

⁵⁸ “Bombardier likely headed to junk by Moody’s,” *Reuters*, August 30, 2004.

Embraer's presence in the United States is thus far limited to support and engineering facilities with a handful of direct employees. As of 2003, Embraer maintained the following U.S. operations:⁵⁹

- Ft. Lauderdale, Fla. (support center)
- West Palm Beach, Fla. (engineering offices)
- Dallas, Texas (administrative offices)
- Nashville, Tenn. (aircraft maintenance and support center)

Embraer takes a systems integration approach to manufacturing, relying on a broad (non-Brazilian) supplier base for aircraft parts. Embraer claims that up to 70 percent of the hardware on their RJs (citing the ERJ-145 as an example) comes from U.S. suppliers.⁶⁰ As with Boeing and Airbus, Embraer is now utilizing risk-sharing partners in the development and production of their newest program, the Embraer 170/190 jet family. Five U.S. companies are primary risk-sharing partners in this program, including:

- General Electric (turbofan engines)
- Honeywell (avionics systems)
- Hamilton Sundstrand (aircraft tail core, auxiliary power unit, electrical systems, and the air management system)
- C&D Aerospace (aircraft interior)
- Grimes Aerospace Company (exterior and cockpit lighting)

Embraer also relies almost entirely on non-Brazilian markets for regional jet sales, and is Brazil's largest single exporter. The Americas (primarily North America and excluding Brazil) account for 74 percent of the company's sales. Many of these customers are regional airlines, low-cost carriers, and even legacy airlines that seek to use RJs to adjust traditional business models. U.S.-based airlines are some of Embraer's largest customers:⁶¹

- American Eagle
- Continental Express
- GE Capital
- Mesa Air
- U.S. Airways
- JetBlue Airways

Embraer is starting to blur the traditional line between large civil aircraft and regional jets as it introduces two new models with 94–118 seats that are roughly the same size as Boeing's

⁵⁹ Embraer, SEC Form 20-F, June 30, 2003

⁶⁰ "Embraer Aims to Produce Airborne Surveillance Platforms at New Florida Facility," *Defense Daily International*, June 6, 2003.

⁶¹ Hoover's Inc.

smallest aircraft. Embraer is scheduled to begin deliveries of the 90–106-seat ERJ-190 in 2005, and the 106–118-seat ERJ-195 in 2006 described in Figure 4.⁶²

Figure 4: ERJ 190 Characteristics

Aircraft	Seating Capacity	Client	Country	Firm Orders
ERJ-190	94–106	JetBlue	U.S.	100
		Undisclosed	N/A	10
ERJ-195	106–118	Crossair	Switzerland	15

Source: Embraer SEC Form 20-F, 2003

Embraer has secured big orders for its new aircraft. JetBlue Airways, whose fleet currently comprises 156-seat Airbus A320s, has ordered up to 200 of the new ERJ-190s (including firm orders and options).⁶³ Air Canada has also agreed to purchase 45 ERJ-190s, subject to the airline finding financing as it emerges from bankruptcy protection.⁶⁴

Embraer is moving away from the traditional model of domestic ownership. The company began as a government-owned entity in 1969, began privatization in 1991, and was listed on the NYSE in 2000. Today, the Brazilian government still owns approximately 30 percent of the company. However, the European Aeronautic, Defense, and Space Company (EADS) owns 2.2 percent of Embraer and is listed as its eighth-largest shareholder. This is of particular interest because EADS itself is partially government-owned. Member companies of the European Aerospace and Defense Group (of which EADS is included) own a total of 7.8 percent of Embraer.⁶⁵

Embraer also is diverging from the traditional model of domestic production. In December 2002, Embraer entered into a joint venture with Harbin Aircraft Industry Co., Ltd., and Hafei Aviation Industry Co., Ltd., subsidiaries of China Aviation Industry Corporations II (AVIC II). The agreement provides for the manufacture, sale, and after-sale support of the ERJ 145 regional jet family. Embraer owns 51 percent of the joint venture.⁶⁶

In September 2004, Embraer took a first step toward a U.S. production presence by breaking ground for a new facility in Jacksonville, Fla., to assemble ERJ-145 aircraft as part of a Defense Department contract to supply the new Aerial Combat System (ACS). The ERJ-145 aircraft assembled here will serve as the ACS platform as part of a system assembled by a Lockheed Martin–led team. Embraer reportedly will expand this facility beyond the initial 200 employees as the ACS program advances, although it is unclear how much of the aircraft’s production will be moved to Florida in the long run.

⁶² “JetBlue Spices Up Its Fleet, Ordering 200 Embraer Jets,” *Wall Street Journal*, June 10, 2003.

⁶³ “Bombardier Considering a New Line of Jets,” *New York Times*, June 2, 2004, www.nytimes.com

⁶⁴ *Airline Business*, May 1, 2004.

⁶⁵ Embraer, SEC Form 20-F, June 30, 2003.

⁶⁶ *Ibid.*

Embraer is teaming with a number of European companies on military projects as well. In March 2002, Embraer formed a consortium with Dassault, Thales, and SNECMA to bid on the development and manufacture of up to 24 fighter jets for the Brazilian Air Force. The planned jet, the Mirage 2000 BR, is modeled on the Dassault Mirage 2000-5 supersonic jet. As part of the strategic alliance, Dassault is to transfer the technology for the Mirage over to Embraer. This collaborative effort is likely linked to EADS ownership.

Bombardier

Bombardier's aerospace manufacturing and production facilities are located in Canada, the United States, and Northern Ireland. Bombardier Aerospace employed a total of 26,300 people at the end of fiscal year 2004.⁶⁷ Bombardier's production facilities include the following:

- Quebec (Saint-Laurent, Dorval, Mirabel)
- Ontario (Downsview, North Bay)
- Northern Ireland (Belfast)
- Kansas (Wichita)
- Arizona (Tucson)
- West Virginia (Bridgeport)

Recently, Bombardier has been struggling to maintain production levels in light of increased competition from Embraer and continued financial problems of key airline customers. In August 2004 it started a slowdown of the production rate of its 50-seat CRJ200. In October 2004 Bombardier announced plans to reduce its aerospace work forces in Montreal, Canada, and Belfast, Northern Ireland, by 2,000 employees over the following nine months.

Unlike the other prime aircraft manufacturers, Bombardier is widely diversified outside of the aerospace sector. Aerospace accounted for 53 percent of Bombardier's corporate sales in fiscal year 2004, with \$8.498 billion in revenue.⁶⁸ Bombardier's other business units include Transportation Products (primarily rail operations, for which Bombardier is the world's largest manufacturer) and Bombardier Capital.

Although Bombardier is a publicly listed company on the Toronto Stock Exchange, the Bombardier family owns more than 50 percent of the company. Much of the content in Bombardier regional jets has in the past come from a broad supplier base across Canada and the United States.⁶⁹ General Electric Aircraft Engines is the sole engine supplier for Bombardier RJs.

International customers (and predominately U.S. airlines) make up almost the entire order book for Bombardier regional jets. As is the case for Embraer, Bombardier's customer base includes

⁶⁷ Bombardier Inc.. annual report, 2003–2004.

⁶⁸ Hoover's Inc.

⁶⁹ Bombardier discussions with U.S. Department of Commerce, Office of Aerospace and Automotive Industries, 1994.

regional airlines, LCCs, and even legacy airlines that seek to use RJs to adjust traditional business models. Bombardier is not actively marketing RJs configured for military purposes.

Bombardier is seeking to match Embraer's move into the 100-plus-seat market by proposing a new series of aircraft consisting of three models with a capacity of 100 to 130 passengers. Currently, Bombardier does not produce an aircraft with more than 86 seats, and technical limitations prevent them from enlarging existing aircraft with simple modifications.⁷⁰ Bombardier started the process with an \$18 million feasibility study in 2004. Recent press reports indicate that Bombardier wants to limit its share of the \$1.1–\$1.5 billion development costs for this new aircraft family to approximately \$400 million. Under this scenario, the government of Canada would provide 25 percent of the funding and risk-sharing partners would provide the difference. Bombardier is in preliminary discussions with potential partners. All Bombardier plants have been invited to bid for assembly of the new aircraft, including plants in the United States and a plant in Belfast, which could seek U.K. government launch aid.⁷¹

4.c. Large Commercial Jet Engines

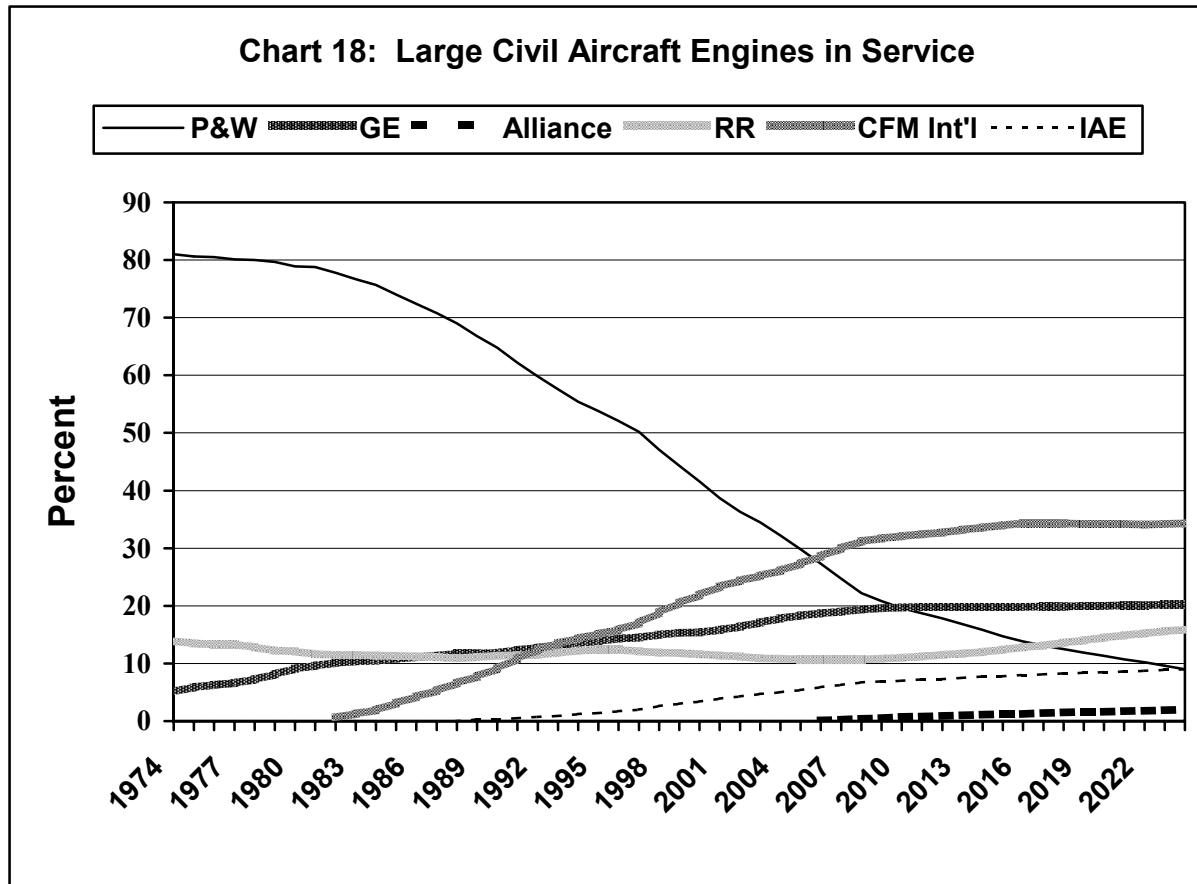
Three prime companies dominate production of large civil aircraft engines: General Electric Aircraft Engines/GEAE (United States), Pratt & Whitney (United States) and Rolls-Royce PLC (United Kingdom). Three other engine manufacturers are joint ventures which include one or more of the big three. The CFM International joint venture of SNECMA Moteurs (France) and GEAE is one of the largest civil aircraft engine producers. International Aero Engines, Inc., is a consortium of Pratt & Whitney (P&W), Rolls-Royce, MTU of Germany, and the Japanese Aero Engines Company. The Engine Alliance LLC is a joint venture between GEAE and P&W to produce an engine model for the A380. GEAE, P&W, and Rolls-Royce manufacture civil aircraft engines for most Boeing and Airbus models as well as Bombardier and Embraer regional jets. They also provide engine overhaul, repair, and fleet management services.

The prime engine manufacturers have similar characteristics. They are highly diversified corporations with aircraft engines accounting for less than half of their corporate revenues. They produce jet engines for both military and civil aircraft. They have operations and partners around the world, and they work extensively through international manufacturing joint ventures.⁷²

⁷⁰ Hoover's Inc.

⁷¹ "Bombardier Mulls UK Plant," *The Financial Times Limited*, July 19, 2004.

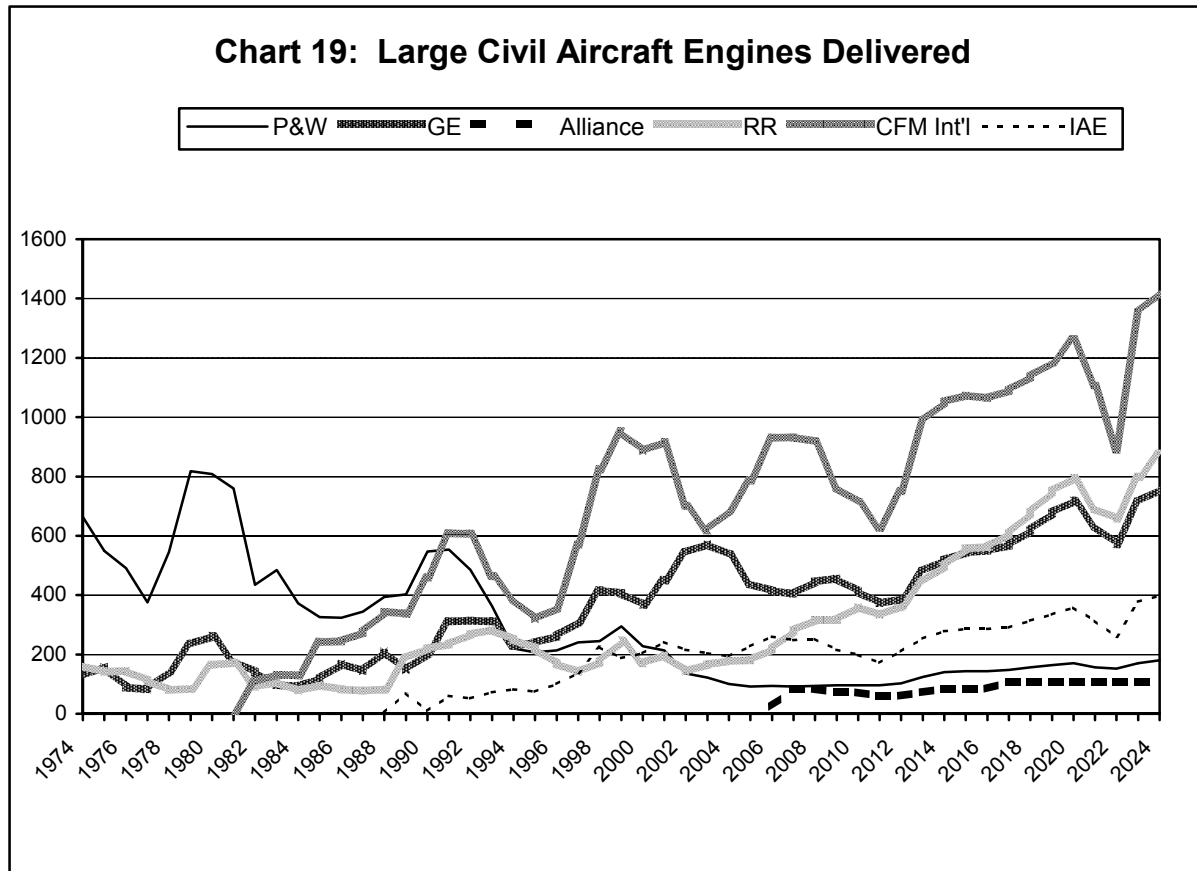
⁷² Company financial reports



Source: *Airline Monitor*, 2004

As shown in Chart 18, the civil aircraft engine market has undergone dramatic changes in the last 30 years. In the early 1970s there were three engine producers, and four out of every five large civil aircraft engines (excluding spares) in service were manufactured by Pratt & Whitney. In the 1980s, two international joint ventures entered the market to provide engines for short-haul aircraft, and by 2003 those two ventures collectively accounted for nearly 30 percent of all engines in service. GEAE and P&W entered into an alliance to jointly produce engines for the new Airbus A380, which will first enter into production in 2006.

Looking forward, every engine company except for Pratt & Whitney is projected to increase its relative share of the in-service market as new programs come on line and older aircraft and engines are retired (see Chart 19). Annual deliveries of P&W engines for long-haul widebody aircraft are projected to almost double over the next 20 years, but the other company deliveries are anticipated to increase even faster. Pratt & Whitney is a key participant in two successful joint ventures as well—the Engine Alliance and IAE. However, as the suppliers for Boeing’s new 787 program, Rolls-Royce and GEAE will have a definite market advantage, if other future aircraft models make use of the new technology being incorporated into the 787 engines.



Source: *Airline Monitor*, 2004

The collapse of prime Russian aircraft engine manufacturing closely mirrored the decline of the rest of the Russian aerospace manufacturing industry. Starting from 1999, Russian engine manufacturers started to experience growth in production and sales volumes, increasing by 30 percent to 50 percent annually. However, as of 2002 those companies had been able to reach only 45 percent of the production levels of the late 1980s.⁷³ Although production rates have risen again in recent years, the impact of Russian engines continues to be negligible since they are only used on Russian-built aircraft.

General Electric Aircraft Engines

GE Aircraft Engines (GEAE) (United States) is a subsidiary of General Electric, the most diversified of the three prime engine corporations. In 2003, only 8 percent of General Electric corporate revenue came from the aircraft engines division. However, that percentage equated to nearly \$11 billion in revenue. Other corporate sectors include insurance, power systems, consumer finance, aircraft leasing, medical systems, consumer products, and plastics. GEAE manufactures large civil aircraft engines for most Boeing and Airbus models. However, it dominates the regional jet aircraft engine market as the exclusive supplier for Bombardier's entire line of regional jets and the two new larger Embraer regional jets—the ERJ-170 and ERJ-190.

⁷³ *Industry Sector Analysis on the Russian Aerospace Sector*, U.S. Department of Commerce, 2002.

GEAE primary manufacturing sites are located in United States. GEAE has facilities in eight U.S. states and service facilities around the world,⁷⁴ and employs 26,000 people worldwide.⁷⁵

GEAE has the most commercially successful international joint venture among the prime engine manufacturers as measured by engine sales. GEAE and SNECMA Moteurs of France operate a 50-50 joint venture formed in 1974 to manufacture the CFM-56 engine for short- and medium-haul Boeing and Airbus aircraft. As the exclusive engine for the Boeing 737—the single civil aircraft model with the highest sales volume in the world—the CFM-56 joint venture has led to a long-running partnership across a wide range of GEAE engine models. GEAE has other international partnerships as well, including a new joint venture with the Japanese manufacturer Honda to market and produce an engine for use on small jets.⁷⁶

Pratt & Whitney

Pratt & Whitney (United States) is a subsidiary of the United Technologies Corporation (UTC). In 2003, a quarter of UTC's \$28.2 billion in corporate revenues came from Pratt & Whitney. Other corporate sectors produce heating and air conditioning units, elevators, engine controls, and helicopters. Pratt & Whitney manufactures large civil aircraft engines for most Boeing and Airbus models.

Pratt & Whitney aircraft engine manufacturing activities are primarily located in the United States. It has facilities in at least 12 states and 11 countries. United Technologies Corporation, parent company of Pratt & Whitney, had approximately 203,300 employees at the end of 2003.⁷⁷

Pratt & Whitney has 13 ventures in Russia, four ventures in China, and a wholly owned subsidiary in Canada. Pratt & Whitney engines are also manufactured in partnership with companies in countries including Germany, Japan, China, and South Korea, and P&W has a partnership with Singapore Airlines in engine overhaul and components repair facilities.⁷⁸

Pratt & Whitney also participates in a multinational consortium, IAE International Aero Engines AG (IAE), to produce the V2500 engine used on narrow-body Airbus and (formerly) McDonnell Douglas aircraft. IAE was incorporated in Switzerland in 1983 to direct the entire V2500 program worldwide. The shareholders, who signed a 30-year agreement, include P&W (United States), Rolls-Royce PLC (United Kingdom), Japanese Aero Engines (Japan)⁷⁹, MTU (Germany), and FiatAvio (Italy). (Fiat Avio is no longer a shareholder of the program, but remains a supplier.)⁸⁰ Although this joint venture had sold fewer total engines than CFM as of

⁷⁴ <http://www.geae.com/aboutgeae/facilities/index.html>

⁷⁵ www.geae.com

⁷⁶ "Big Plans for Small Aircraft," *The Cincinnati Enquirer*, February 17, 2004.

⁷⁷ United Technologies Corporation, Form 10-K, 2003.

⁷⁸ www.utc.com

⁷⁹ Japanese Aero Engines including participation of Japanese companies Mitsubishi Heavy Industries (MHI), Kawasaki Heavy Industries (KHI), and Ishikawajima-Harima Heavy Industries (IHI).

⁸⁰ www.i-a-e.com/company/history.shtm

the end of 2003 (1,940 vs. 10,480 engines), sales have increased steadily since the first engines entered service in 1988, and IAE is expected to deliver more engines for the A320 than CFM over the next 20 years (3,380 vs. 2,540 engines).⁸¹ The success of the V2500 has led to partnerships on other aircraft engine programs among some of the members of the consortium.

Rolls-Royce PLC

The third prime aircraft engine producer is Rolls-Royce PLC of the United Kingdom. Nearly half (47 percent) of Rolls-Royce corporate revenues came from aerospace sales in 2003. However, most of the other Rolls-Royce activities are in the power generation field. Like GEAE and Pratt & Whitney, Rolls-Royce manufactures large civil aircraft engines for most Boeing and Airbus models.

Rolls-Royce civil aircraft engine manufacturing activities are primarily located in Derby, United Kingdom. The Rolls-Royce Group (including defense and other operating segments) has facilities in 66 locations in 26 U.S. states and a significant global presence.⁸² Rolls-Royce averaged 20,400 employees involved in civil aerospace globally in 2003.⁸³ Rolls-Royce is a member of the IAE multinational consortium.

Rolls-Royce has a significant manufacturing presence in the United States through its wholly owned subsidiary (formerly Allison Engine Company in Indianapolis acquired by Rolls-Royce in 1995). Through this subsidiary, Rolls-Royce North America is the sole supplier of civil aircraft engines for the smaller Embraer ERJ-135 and ERJ-145 regional jets. This subsidiary also produces smaller engines for Cessna, Gulfstream, and Raytheon general aviation aircraft as well as military helicopter and fighter jet engines.

4.d. Conclusions

Competition among civil aircraft and engine manufacturers has been fierce over the last 30 years, and relative market shares have changed dramatically. Airbus has attained roughly 50 percent of the global LCA market, following the departure of two U.S. LCA companies and the near-disappearance of Russian manufacturers. Regional jet manufacturers from Brazil and Canada have completely displaced long-time manufacturers of smaller civil transport aircraft in global markets, and are about to directly compete with Boeing and Airbus in the 100-plus-seat jet category. LCA engine manufacturers increasingly look to multinational joint ventures and partnerships to spread risk and reduce the cost of capital investment in new engine programs. In fact, two LCA-engine joint ventures—CFM and IAE—accounted for more than 30 percent of all LCA engines in service in 2004, even though they began producing engines starting in 1982 and 1988, respectively.⁸⁴

No single factor is responsible for these shifts in market share. In part, the shifts are the result of evolving customer preferences and operator business models, the introduction of new products

⁸¹ *The Airline Monitor*, August 2004.

⁸² www.rolls-royce.com

⁸³ Rolls-Royce Group plc; 2003 Annual Report.

⁸⁴ See Chart 18.

and services, and different corporate management strategies. LCA, engine and RJ manufacturers design models to match and compete with each other in various market segments. Broadly speaking, the cost and performance characteristics of models in a particular market segment are largely similar. Nonetheless, manufacturers have introduced innovations to their product lines, and the characteristics of each aircraft or engine will make it more or less suitable for any particular operation. The success of each manufacturer is in part dependent upon its ability to manufacture, market, and sell products that provide optimal commercial value to its customers. The increasing use of RJs for passenger airline operations is a key example of how new technology and capabilities evolve to fill new market needs, and even change the market itself.

Airlines consider multiple commercial factors when choosing aircraft and engines. Performance characteristics (range, speed, and passenger/cargo capabilities), acquisition costs, and the mix of aircraft in an operator's fleet are key considerations. Other key factors include flight operating expenses (as described in Chapter 3.b.), such as fuel, landing costs, maintenance, staffing requirements, etc., and product support (training, servicing, or even aircraft performance guarantees).

Some selection factors have more general implications for sales than others. For example, common aircraft cockpits or models across a particular fleet reduce an airline's pilot training and certification costs and increase the airline's route and scheduling flexibility. Common aircraft or engine models also result in relatively lower maintenance and spare-parts inventory costs. LCCs in particular tend to operate only one or two aircraft models to maximize this benefit, although fleet commonality is a noticeable characteristic across all types of airlines.

However, it is more difficult to generalize about the implications of other aircraft model characteristics. Airline fleet planners select aircraft and engines most suitable for their specific routes and flights by using proprietary planning models to assess the cost and performance factors for each model. This is necessary because the average operating cost per hour can vary widely across airlines for even a specific aircraft and engine type, as shown in Figure 5. For example, according to data in the 2003 *Airline Monitor* commercial aircraft data base, the average total operating cost per block hour for an Airbus A319 across five U.S. airlines was \$2,166/hour.⁸⁵ However, the average per-hour operating cost ranged from \$1,882/hour at Northwest to \$2,579/hour at U.S. Airways. Per-hour operating costs for the comparable Boeing aircraft (737-700) vary in a similar manner.

⁸⁵ A block hour is an hour of actual flight time in an aircraft, including time spent on take/off and landing procedures (the time between aircraft departure from the gate and arrival at the destination gate).

Figure 5: Per-hour Operating Cost by Aircraft Type for 2003*						
	America West	Northwest	United	US Airways	Frontier	Average
Total cost per block hour - A319	\$1,909	\$1,882	\$2,175	\$2,579	\$2,255	\$2,166
	Alaska	Continental	Southwest	Aloha	Midway	Average
Total cost per block hour - 737-700	\$1,696	\$2,091	\$1,488	\$2,422	\$2,513	\$1,697
* Per-hour operating cost includes flight crew, fuel and other cost, direct maintenance of airframe and engines, maintenance burden, depreciation, and aircraft rent.						

Source: *The Airline Monitor*, August 2004

As another example, maintenance costs per flight hour for a particular aircraft vary considerably, depending upon the way the aircraft is operated. In general, aircraft that are operated on relatively frequent, short-flight segments have higher maintenance costs per flight hour in a given year than aircraft operated on infrequent, long-flight segments. A major aerospace industry journal published an analysis in 2002 of the maintenance costs of four twin-aisle aircraft with similar mission capabilities: MD-11, A330, A340, and B777.⁸⁶ According to the analysis, the annual per-flight-hour maintenance cost of a B777 is 0.538 percent less than the maintenance cost of an Airbus A330 when both aircraft are operated frequently at short ranges (\$1,110/flight hour for the B777 vs. \$1,116/flight hour for the A330).⁸⁷ For these same aircraft, the cost savings increase to 8.07 percent when operated less frequently on longer flight segments (\$763/flight hour for the B777 vs. \$830/flight hour for the A330).⁸⁸

These examples are intended to illustrate two points. First, there are many considerations that will determine which aircraft and engine combination may provide optimal value for a particular airline operation. Second, product differentiation and bottom-line commercial considerations, while very important, cannot alone fully explain the changing market shares among LCA and engine manufacturers over the last 30 years.

⁸⁶ *Aircraft Commerce*, August/September 2002. p. 23-30.

⁸⁷ Frequency of 1,100 to 1,000 flight cycles/year and duration of 3,300 to 3,000 flight hours/year, respectively.

⁸⁸ Frequency of 600 and 550 flight cycles/year and duration of 5,000 flight hours/year, respectively.

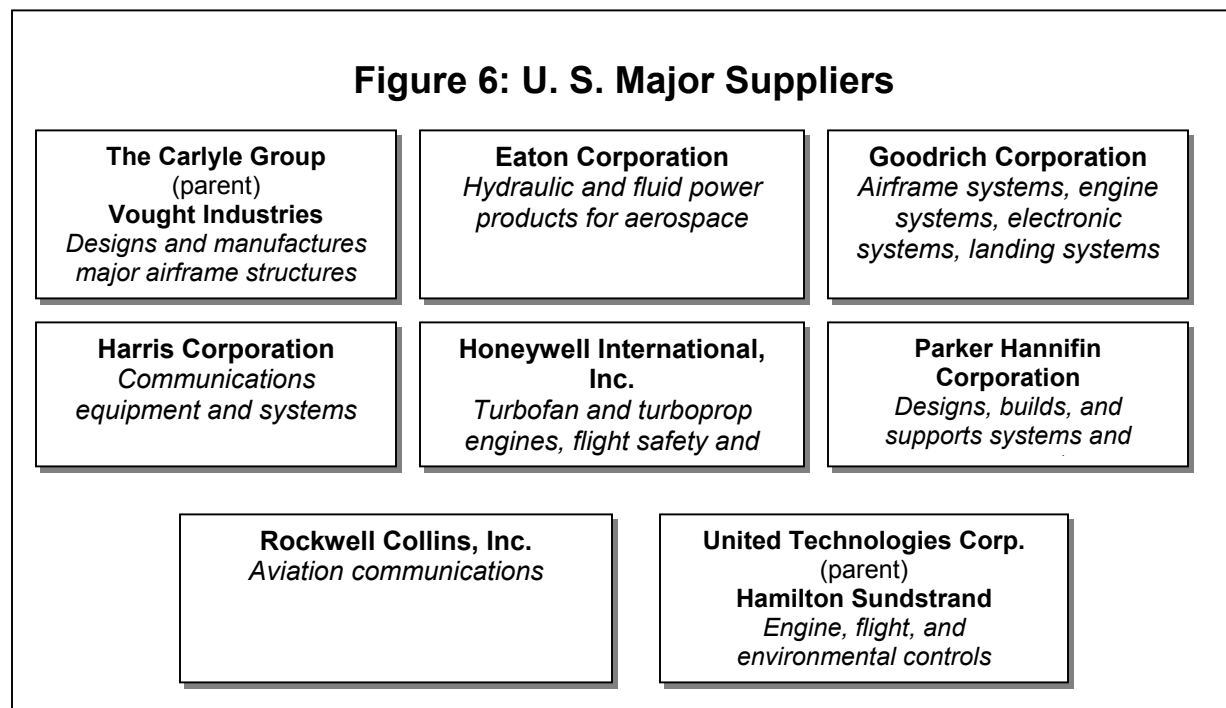
Chapter 5 – Major Suppliers – The Global Supply Chain

Tens of thousands of companies around the world make up the global supply chain for the aerospace industry. They provide a wide variety of materials and products that are incorporated into aircraft and engines produced by the primes. A handful of major suppliers in a few countries dominate this segment of the industry, producing large and complex subsystems and components such as aircraft structures, landing gear, or electronic systems.⁸⁹ Many of the major suppliers are based in the United States and Europe. Russia, Japan, South Korea, and China also boast a number of major suppliers.

5.a. United States

U. S. companies in the global supply chain range from multi-billion-dollar companies providing major subsystems such as landing gear, avionics, or aerostructures to small companies providing components or services. Some of these companies used to be divisions of prime aerospace corporations that were sold or spun off.

Figure 6: U. S. Major Suppliers



⁸⁹ For the purposes of this report, the major suppliers to the civil aircraft and engine prime manufacturers are identified as companies listed in the “2004 Prime Contractor and Major Manufacturer Profiles” section of the annual publication *Aviation Week & Space Technology Aerospace Source Book*, or as major contributors to, or joint venture partners in, current or future large civil aircraft and related engine programs.

The eight major U.S. civil aerospace suppliers are listed in Figure 6. They predominately manufacture large structures or subassemblies, such as fuselages or landing gear, or components such as avionics or communications equipment. Their products make up a significant portion of the overall value of the large commercial aircraft or regional jet model into which they are incorporated. Many of these companies are suppliers to military or defense-related aerospace programs as well. Some of them even produce complete products for other aerospace equipment, such as Honeywell engines used on business aircraft and helicopters. Like the U.S. primes, U.S. major suppliers are financially healthy. Seven of the eight suppliers in Figure 6 were rated investment grade as of March 2005.⁹⁰

U.S. suppliers are no longer wholly dependent upon U.S. prime manufacturers for sales. As noted above, U.S.-manufactured components are widely used in commercial jet aircraft and engines produced around the world. Large U.S. aerospace suppliers even participate as risk-sharing partners on some of the newest programs, such as the Airbus A380 or the Embraer ERJ-170/190. In some cases suppliers may sell the same type of part or component to multiple primes, such as to Boeing as well as Airbus. In other cases they may produce different equipment for different markets.

In addition to the major suppliers listed in Figure 6, there are tens of thousands of smaller U.S. suppliers to the aerospace industry. A full accounting of their size and economic activity is difficult to calculate. In fact, some of these companies supply products to a variety of industries and are not considered “aerospace” manufacturers. However, as one measure, Boeing reports that it paid more than \$24 billion between June 2003 and June 2004 to more than 32,000 businesses in the United States, including production suppliers, non-production vendors, and subsidiaries of companies to which Boeing made other payments.⁹¹

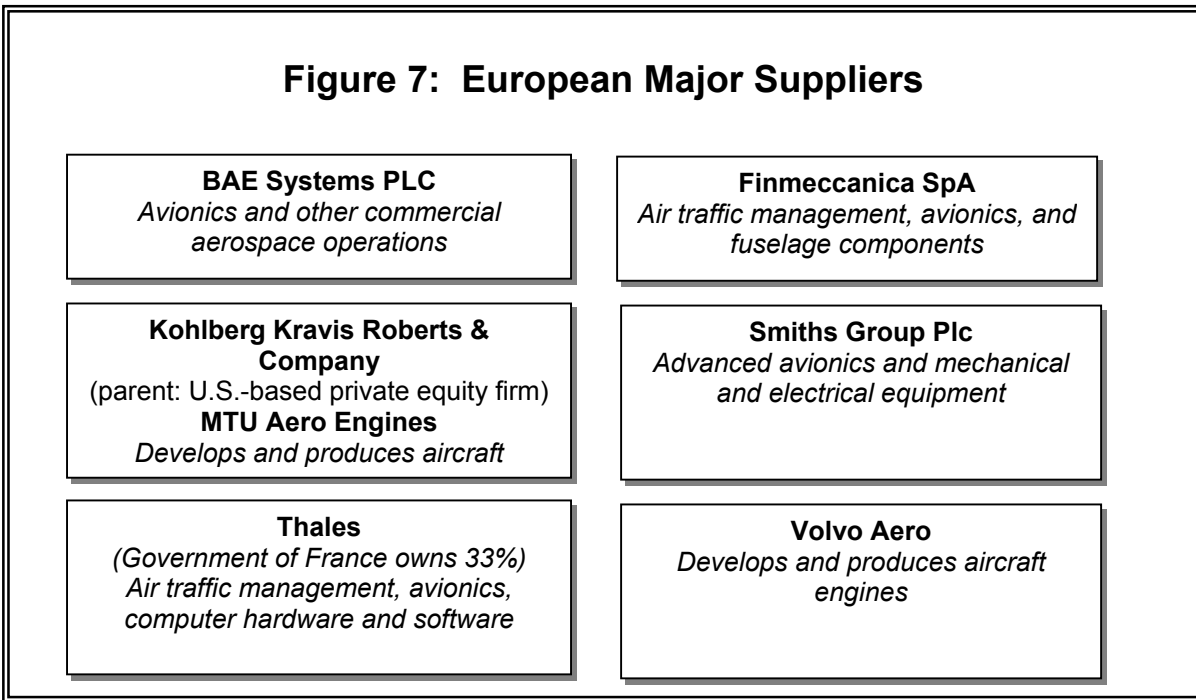
5.b. Europe

As is the case in the United States, large and small European aerospace companies supply the full range of aerospace products and services. The six companies listed in Figure 7 are the leading European suppliers to large commercial transport aircraft programs. Like their U.S. counterparts, they too manufacture large structures or subassemblies, such as fuselages or landing gear, or components such as avionics or communications equipment. Again, there are thousands of other companies across the European Union that are suppliers to commercial and military aircraft programs, and some are even prime producers of complete military aerospace products.

⁹⁰ Office of Aerospace and Automotive Industries review of *Bloomberg Professional* company financial listings.

⁹¹ *Boeing in the States 2004*, Boeing, June 2003–June 2004.

Figure 7: European Major Suppliers



All of the European companies in Figure 7 supply parts and components used in U.S. aircraft and engines or partner with U.S. manufacturers in aerospace joint ventures. There is significant variety in the ownership of European major suppliers. Some European manufacturers are partially government-owned. On the other hand, MTU Aero Engines is owned by a U.S.-based private equity firm.

5.c. Russia

Although Russian aerospace companies have essentially lost their position as prime manufacturers of large civil aircraft, they have been somewhat successful in supplying materials, parts, and engineering services for Western commercial aircraft and engines.⁹² Boeing has reportedly invested more than \$1.3 billion⁹³ into Russian joint ventures since the early 1990s, enabling it to tap into the vastly underutilized expertise of Russian aerospace experts who have extensive experience as well as different approaches to engineering and manufacturing issues than their Western-trained counterparts. Boeing operates the Boeing Design Center in Moscow, employing Russian engineers to work in research, materials, design, information technology, and modification work on the 777, the 787, and other commercial aircraft models. Russia is a key supplier of raw materials—especially titanium—used in Western aerospace production.

European industry also has pursued this approach. In July 2001, Airbus's parent company EADS signed a cooperation agreement with the Russian Aerospace Agency and agreed to invest more than \$2 billion in the Russian aerospace industry over a ten-year period.⁹⁴ The agreement calls for a broad range of cooperative projects, including Russian participation in the A320, A380, and other Airbus projects.

⁹² http://www.boeing.com/commercial/777family/pf/pf_background.html

⁹³ http://www.boeing.com/news/releases/2002/q3/nr_020805a.html

⁹⁴ "Negotiations between EADS and Russian Aerospace Agency Rosaviakosmos Finalised," EADS press archives, July 2, 2001, <http://www.eads.net>

Sometimes these investments appear to have been tied to increasing market presence in Russia of Western-manufactured equipment. The EADS joint venture was followed soon after by the acquisition of 18 new Airbus aircraft by the Russian flag carrier Aeroflot. However, purchases and leases of Boeing and Airbus aircraft by Russian airlines remain limited due to a number of factors, including Russian government policies such as high import taxes intended to promote procurement of Russian-produced aircraft and the inability of Russian airlines to secure sufficient financing.

Russian aircraft manufacturers have sought to make their domestically produced aircraft competitive and attractive to Russian and foreign carriers by upgrading them with Western avionics and engines to bring them into compliance with international noise, emissions, navigation, and other requirements. Several large U.S. aerospace companies are engaged in joint production projects and supply equipment used on Russian aircraft platforms. GEAE, Honeywell, and Pratt & Whitney supply engines for various Russian-built aircraft and helicopters. Hamilton Sundstrand provides propellers. Honeywell also provides power units and avionics, and its Traffic Collision Avoidance System (TCAS) is installed on about 300 Russian-built aircraft.

Russian manufacturers also have sought partnerships and cooperative ventures with Western manufacturers to help them develop new aircraft. For example, Pratt & Whitney entered into a strategic partnership with Perm Motors Joint Stock Company, which is developing an internationally compliant upgrade to the widely used PS-90A engine in Russia.⁹⁵ In 2004, Boeing entered into a contract with Russian manufacturer Sukhoi to help develop and market the Russian Regional Jet (RRJ), which is designed to replace aging Russian airplanes and intended to compete worldwide with those made by Bombardier and Embraer.⁹⁶ SNECMA Group of France is developing the engine, in cooperation with NPO Saturn, with French government assistance worth €250 million.⁹⁷ Russian airline SIBIR has already been identified as the launch customer for this new family of aircraft, announcing orders for 50 of the 95-seat-version aircraft with first deliveries in 2007. It has also been reported that other clients considering the aircraft are Aeroflot, Air France, and California-based International Lease Finance Corporation (ILFC).⁹⁸

Nonetheless, significant additional hurdles must be overcome before Russian aircraft production rates will increase. Upgraded Russian aircraft typically are not economically and operationally competitive with Boeing and Airbus aircraft. New aircraft programs are unproven, and continued financial and production obstacles present challenges to Russian manufacturers. The absence of global support networks, and limited opportunities for resale of used aircraft are additional disincentives for Western airlines to purchase Russian aircraft.

⁹⁵ "Pratt & Whitney in Russian Gas Turbine Accord," *Dow Jones Newswires*, August 9, 2000.

⁹⁶ "Sukhoi picks up pace on RRJ," *Concise B2B Aerospace*, June 17, 2003.

⁹⁷ "Paris Breathes New Life into Jet Project," *The Moscow Times*, September 20, 2004.

⁹⁸ *Ibid.*

In spite of these joint ventures, Russia has not given up on independently establishing a viable domestic prime manufacturing sector again. The government of Russia announced plans in February 2004 to consolidate the existing Russian major aerospace companies (Sukhoi, MIG Irkut, Ilyushin, and Tupolev) into a consortium. By 2006 this consortium might be consolidated into a single company (United Aircraft Building Company/OAK). This is the most recent of a long series of plans to revitalize the Russian aerospace manufacturing industry and recapture its position as a global prime producer of large civil aircraft and engines. Without recovery of the traditional customers of Russian aircraft manufacturers or the manufacturers themselves, however, it is difficult to predict when this might actually happen. To meet this challenge head on, the Russian government has even proposed underwriting a new Russian aircraft leasing company to be the buyer of newly produced Russian aircraft.⁹⁹

5.d. Japan

Japanese aerospace companies have established themselves in the global aerospace industry as important manufacturers of a wide range of civil, military and corporate aerospace products. They supply components and structures for a wide range of commercial aircraft (especially Boeing and Airbus jet transports) and aircraft engines.

In spite of their diverse and longstanding manufacturing programs, individual Japanese companies lag in size behind leading firms in the United States and Europe. The overall Japanese aerospace manufacturing industry is about half the size of the industries in the United Kingdom or France, and one tenth the size of the U.S. aerospace industry. Nonetheless, increasing participation in new aircraft programs has led to a 24 percent increase in Japanese aerospace production over the last decade.¹⁰⁰

The Japanese aerospace industry is dominated by the four “heavies”: Mitsubishi Heavy Industries (MHI), Kawasaki Heavy Industries (KHI), Ishikawajima-Harima Heavy Industries (IHI), and Fuji Heavy Industries (FHI).¹⁰¹ Together these four companies account for around two thirds of the industry's total sales (including space equipment and related sales) and lead Japanese aerospace research and development. These four companies, together with a wide range of smaller Japanese companies, employ around 30,533 aerospace workers.¹⁰² Aerospace products make up only about 20 percent of total sales (in fiscal year 2002) of the individual largest companies, which are widely diversified among strategic businesses such as industrial machinery, shipbuilding, electrical machinery, and automobiles.¹⁰³

The expansion into new civil markets has been aided significantly through financial support from the Japanese government, such as through the International Aircraft Development Fund (IADF) made up of the four heavies and the Ministry of Economy, Trade and Industry (METI).¹⁰⁴ For

⁹⁹ “Industry Ministry: Aircraft Construction Sector Needs USD 2.5 billion State’s Support”, *ISI-Intellinews*, September 20, 2004.

¹⁰⁰ The Society of Japanese Aerospace Companies (SJAC), 2003. www.sjac.or.jp/english/003.html

¹⁰¹ Ibid.

¹⁰² Ibid.

¹⁰³ Ibid.

¹⁰⁴ The Japanese Ministry of International Trade and Industry (MITI) was the Japanese Government agency responsible for this activity prior to being reorganized into METI in 2001.

example, in 1996 the Japanese government provided ¥2.9 billion (\$24 million USD) to assist with Japanese participation in the Boeing 777 program, and ¥1.6 billion (\$13 million USD) for the International Aero Engines V2500 engine project.¹⁰⁵

More than 85 Japanese companies, including the four heavies, are program partners, subcontractors, or suppliers to Boeing across its commercial-airplane product lines.¹⁰⁶ Japanese-manufactured parts and components make up significant portions of the Boeing 777,¹⁰⁷ and Japanese companies have been identified as significant risk-sharing partners in Boeing's new 787 program.¹⁰⁸ Boeing also has extensive relationships with Japanese airlines. Through year-end 2002, Japan had ordered 644 Boeing airplanes worth approximately \$61 billion (in 2002 dollars). In the past decade, 78 percent of the airplanes ordered by Japanese customers have been Boeing products, and Japan is the largest customer for Boeing twin-aisle airplanes.¹⁰⁹

Airbus has actively pursued partnerships with Japanese companies on new aircraft programs such as the A380, possibly in hopes of capturing a larger share of Japan's large jet transport market. Seven Japanese suppliers, including MHI, FHI, and the Japan Aircraft Manufacturing Company, have been signed up to manufacture parts for the A380 over a period of 20 years, for a total of \$850 million in components including cargo doors and parts of the tail.¹¹⁰

The Japanese aerospace industrial base is not limited to supplying other manufacturers, however. Japanese companies also produce complete small jet and turboprop aircraft and helicopters, military aircraft and trainers, and space launch vehicles. Almost two thirds of total Japanese aircraft production historically has consisted of military aircraft sold to the Japanese Defense Agency.¹¹¹ Often these aircraft were manufactured under technical license or in coordination with non-Japanese (mostly U.S.) companies.¹¹² Many indigenous military aircraft programs have had relatively small production runs, in large part due to a 1967 Japanese government ban on military product exports. This continuing ban and shrinking domestic defense budgets have led Japanese companies to seek out new opportunities to participate in civil aircraft programs.

Analysts have speculated about the potential for Japanese companies to develop and produce a wholly indigenous large civil jet transport, given their extensive aerospace manufacturing capabilities. However, Japanese investments in new major Boeing and Airbus aircraft programs such as the 787 and, to a lesser extent the A380, may be indications that they are for now focusing their efforts as partners in global programs.

¹⁰⁵ The Society of Japanese Aerospace Companies (SJAC), 1998. www.sjac.or.jp/english/01_a.htm

¹⁰⁶ "The Boeing Company and Japan," November 18, 2003.

www.boeing.com/companyoffices/aboutus/boejapan.html

¹⁰⁷ <http://www.sjac.or.jp/english/008.html>

¹⁰⁸ "Groups move closer to Boeing 7E7 deal," *Financial Times*, October 20, 2004.

¹⁰⁹ "The Boeing Company and Japan," November 18, 2003.

www.boeing.com/companyoffices/aboutus/boejapan.html

¹¹⁰ "Airbus Picks Three More Suppliers from Japan for Its A380 Jet," *Wall Street Journal*, June 2002.

¹¹¹ <http://www.sjac.or.jp/english/003.html>

¹¹² See footnote 101.

5.e. South Korea

South Korean aerospace companies have supplied commercial aircraft aerostructures and components for a range of Boeing and Airbus programs. Although they do not manufacture complete civil jet transport aircraft or engines, they have a long history of manufacturing or assembling defense-related products. In 2003, the South Korean aerospace industry ranked eleventh in the world in terms of aerospace manufacturing capacity.¹¹³

The South Korean industry is dominated by Korea Aerospace Industries Ltd (KAI), created by the government of the Republic of Korea (ROK) in 1999 with the consolidation of Samsung Aerospace, Daewoo Heavy Industries, and Hyundai Space and Aircraft Company.¹¹⁴ Creation of KAI helped somewhat to reduce overcapacity and redundancy among the South Korean aerospace work force. As a result, the South Korean aerospace work force has dropped slightly from around 12,000 in 1997 to 11,000 in 1999.¹¹⁵

Eighty-nine percent of KAI's manufacturing is of defense-related products, such as fighter and trainer aircraft, helicopters, and satellites. While South Korean aerospace companies have had a long relationship with U.S. military and civil producers, European companies have had limited partnerships with KAI. In 1999, KAI entered into partnership with EU firm Eurocopter to develop the South Korean Light Helicopter Program. KAI has also entered into partnerships with Canadian companies CMC Electronics and Pratt & Whitney Canada to develop KT-1 fighter aircraft for the South Korean Air Force.

The other major South Korean aerospace manufacturer is Korean Airlines (KAL), also the major airline operator. Its primary activities include rebuilding planes and retrofitting work. In the decade between 1976 and 1986, KAL held the monopoly on military aircraft production in South Korea, producing 500MD helicopters and F-5E/F fighters. Ten years later, KAL began manufacturing F-16 fighters and UH-60 helicopters with U.S. partners Lockheed Martin and Northrop Grumman. KAL has a long history of supplier contracts with Boeing, Airbus, and the former McDonnell Douglas. KAL's anticipated acquisition of KAI, starting with a Memorandum of Understanding signed in 2003 by the two companies, is anticipated to further eliminate duplication of efforts and investments.¹¹⁶ A greater focus on commercial sales of the new corporation will balance its diversification among military and civil projects.

The South Korean government has played a predominant role in the evolution of the South Korean aerospace industry through direct funding and overall management of the industry. The government's Korea Aerospace Research Institute (KARI) performs aerospace R&D and supports expensive large-scale testing and evaluation by industry, universities, research institutes, and the military, such as wind tunnels and structure-testing facilities. The South Korean government has provided KAI with 100 percent of its funding for military R&D projects

¹¹³ *Aerospace Industry Market Brief—South Korea 2003*, U.S. Department of Commerce, November 12, 2003. www.export.gov/marketresearch.html

¹¹⁴ Ibid.

¹¹⁵ "Korean Airlines Moves to Gain Control of Korea Aerospace Industries," U.S. Department of Commerce, October 21, 2003. www.export.gov/marketresearch.html

¹¹⁶ Ibid.

and 50 percent of its funding for civil R&D projects.¹¹⁷ As of 1999, the South Korean aerospace industry had received about \$2.75 billion USD in government funding.¹¹⁸ At the time, the government announced that it would triple its financial support for the aerospace industry by 2003.¹¹⁹ Over the next few years, the country seeks to rise to sixth position through the government's strong support of aerospace industry development.

5.f. China

The People's Republic of China is likely to be the single largest customer—and possibly an emerging competitor—of the U.S. aerospace industry in the future. Today, China's aviation industry consists of more than 200 enterprises that produce and manufacture products such as aircraft, turboprop engines, aircraft components and subsystems, helicopters, industrial gas turbines, and various electromechanical products. Military products produced in China include fighters (F7, F8, and their derivatives), fighter-bombers (FBC-1), bombers (H5 and H6 series), transports, trainers (FT6, FT7, HJ5), and reconnaissance aircraft.¹²⁰ China's first successful manned space launch in late 2003 makes it the third country in the world (after the United States and Russia) to put a human in space on its own rocket.

In 1999, China established 10 new state-owned enterprises (SOEs), and all of China's large aerospace-related institutes were operationally merged with enterprises in their area of specialty. The two industry leaders for aircraft are China Aviation Industry Corporations I (AVIC I), which focuses on large- and medium-sized aircraft, leasing and general aviation aircraft, and China Aviation Industry Corporations II (AVIC II), which produces small aircraft, feeder aircraft, and helicopters. Together these two SOEs hold 134 large- and medium-sized industrial enterprises, including 31 research institutes and 20 specialized companies and institutions engaged in foreign trade, material supply, science and technology and product development.

AVIC I and AVIC II and their subsidiaries have about 491,000 employees¹²¹ and have total combined assets of approximately \$8 billion.¹²² In spite of their focus on aviation-related production, these conglomerates are widely diversified across multiple manufacturing sectors. In 2003, AVIC II reported revenue of \$2.8 billion, of which \$1.8 billion came from the company's auto business, which claims some 40 percent of China's auto market.¹²³

Technological advancement of China's aviation industry has moved hand in hand with cooperation and investment from international firms. For years Boeing has sourced horizontal

¹¹⁷ *Competitive Assessment of the U.S. Large Civil Aircraft Aerostructures Industry*, ITC Publication 3433, Investigation No 332-414, June 2001.

¹¹⁸ *Aerospace Industries in South Korea*, U.K. Department of Trade and Investment, June 18, 2004.
www.uktradeinvest.gov.uk/aerospace/south_korea/profile/overview.shtml

¹¹⁹ *Competitive Assessment of the U.S. Large Civil Aircraft Aerostructures Industry*, ITC Publication 3433, Investigation No 332-414, June 2001.

¹²⁰ www.avic1.com.cn/English/index.htm

¹²¹ NTI Research Library <http://www.nti.org/db/china/avic1.htm>

¹²² *China Civil Aviation Sector Summary for 2001*, British Embassy, Beijing.

¹²³ *People's Daily*, January 12, 2004.

stabilizers and vertical fins for the 737 from Shanghai Aviation Industrial Corporation and the Xi'an Aircraft Company, respectively. Boeing also contracts parts such as tail fins, nose cones, and aircraft doors for multiple aircraft models from Chinese companies. Chinese companies already supply components to some Airbus models. They also have entered into cooperative ventures with Eurocopter to produce helicopters for sale in China as well as export markets. Canadian company Bombardier has sourced parts from China for some of its aircraft beginning in the 1980s.

Cooperative efforts extend beyond the supply of aircraft components. Boeing plans to partner with Shanghai Airlines and Shanghai Pudong International Airport to build the first factory-owned maintenance, repair, and overhaul (MRO) center to service B-777s across Asia. U.S. companies also have partnered with Chinese companies to incorporate U.S. engines and components on Chinese aircraft. Starting in the late 1980s and into the early 1990s, Pratt & Whitney established joint ventures with Chinese firms to manufacture turboprop engines for several of China's Y-series transport aircraft.

Programs based on large commercial aircraft co-production have had mixed results. One of the most extensive U.S.–Chinese civil manufacturing partnerships was a program started in 1985 with McDonnell Douglas to assemble MD-82 aircraft in China. Thirty-five of these aircraft were produced, five of which were sold in the U.S. market.¹²⁴ In 1994, McDonnell Douglas finalized an agreement to coproduce MD-90s in China, but only two of the planned 40 aircraft were ever assembled, and the project was cancelled in 1998.¹²⁵ Plans announced in 1996 by Chinese and Airbus officials to jointly build a 100-seat “Asian Express” aircraft that would be added to the Airbus product line similarly stayed on the drawing board and never came to fruition.¹²⁶ Chinese companies have a long history of industrial cooperation with Russian aerospace companies, although such programs have been negatively affected by the troubles facing the Russian industry.

Chinese companies have found a willing international partner in Embraer for coproduction of regional jets. AVIC II owns 49 percent of a joint venture with Embraer to manufacture, assemble, sell, and provide after-sales support for the ERJ 135/140/145 family aircraft in Harbin, China.¹²⁷ Sichuan Airlines took delivery of the first aircraft in December 2003, and China Southern Airlines has placed an order for six more.

Although shying away from coproduction of large civil aircraft, U.S. and European manufacturers continue to press hard to expand partnerships with Chinese aerospace companies. Boeing is expanding its relationship with China through plans to double its annual purchases from Chinese companies over the next six years to more than \$1 billion per year by 2010.¹²⁸ EADS officials have publicly announced a number of joint initiatives they are pursuing with

¹²⁴ *The Changing Structure of the Global Large Civil Aircraft Industry and Market: Implications for the Competitiveness of the U.S. Industry*, ITC Publication 3143, Investigation No 332-384, November 1998.

¹²⁵ *Ibid.*

¹²⁶ “Believing in a jet plane,” *South China Morning Post*, September 24, 2002.

¹²⁷ *Commercial Aviation Today*, December 2, 2002.

¹²⁸ “Boeing Seeks Higher-Level Cooperation with Chinese Suppliers,” *Business Daily Update*, <http://mutex.gmu.edu:2056/universe/printdoc>

Chinese companies ranging from subcontracts on Airbus aircraft programs to establishment of engineering and training centers.¹²⁹

China has big plans for its future indigenous civil aircraft manufacturing sector. China's first business aircraft, the Little Eagle 500 developed by AVIC II, flew its maiden flight in October 2003 and was originally scheduled to enter service in late 2004.¹³⁰ AVIC I is developing China's first indigenous regional jet, the ARJ21, albeit with significant contributions from U.S., European and Russian aerospace manufacturers. Ten U.S. aerospace companies supply major components on the ARJ21, and Ukrainian manufacturer Antonov is designing the ARJ21 wings.¹³¹ AVIC I hopes to sell 500 regional jets in 20 years, and is seeking FAA certification to facilitate exports of the aircraft. Targeting 80 percent of Chinese passenger flights that carry fewer than 100 passengers, AVIC I already has launch orders for 35 aircraft from three Chinese airlines.¹³² AVIC I is seeking to establish a role for itself as a developer and systems integrator on this new program, perhaps with an eye to future—and larger—aircraft programs.

China's transition to a viable prime producer of commercial jet aircraft and engines will be aided by its large and growing domestic aviation market, providing a ready market for new indigenous aircraft. China's aviation industry is arguably the fastest growing aviation industry worldwide. Air traffic in China has increased threefold between 1980 and 2004.¹³³ AVIC I predicts that passenger traffic alone is expected to grow 8.5 percent annually over the next two decades.¹³⁴ Given that there are only about 1,100 registered aviation aircraft operating in China (compared to roughly 219,000 in the United States¹³⁵), industry analysts predict that Chinese airlines will add nearly 2000¹³⁶ large- and medium-sized aircraft to their fleets over the next two decades. Boeing currently enjoys a dominant market position in China with around 70 percent of the current operating fleet. Boeing sold its first commercial jet to China in 1972 following President Nixon's trip to China. The first Airbus delivery to China occurred in 1994.

Not surprisingly, Boeing and Airbus have identified China as the single most important market for new sales over the next 20 years, and both companies are working hard to win new orders from Chinese airlines. As of the end of 2004, nine Chinese airlines had selected 103 Boeing aircraft for purchase. On January 28, 2005, Boeing announced a new order for 60 787s to be divided among six Chinese airlines. Airbus also has scores of aircraft on order by Chinese

¹²⁹ "The Chinese aerospace industry is and will be the permanent partner of EADS," EADS news release, November 2, 2004.

¹³⁰ Xinhua News Agency, October 27, 2003.

¹³¹ "AVIC I Commercial Aircraft," *Aviation International News*, January 2005.

www.ainonline.com/Features/regionalbusaircraft/arj21a.html

¹³² "ARJ21 structural design nearly done," *Aviation International News*, January 2005.

http://www.ainonline.com/issues/01_05/01_05_arj21_67.html

¹³³ "China's aviation industry to soar, Boeing predicts," *Business Report*, November 1, 2004.

<http://www.businessreport.co.za/index.php?fArticleId=2282356>; "China's aviation industry to retain robust growth," *China's People's Daily Online*, March 26, 2000. http://english.people.com.cn/200407/14/eng20040714_149522.html

¹³⁴ "Forecast Summary by Market and International Cooperation Department of AVIC I," *China Aviation News*, November 17, 2000.

¹³⁵ Speech by CAAC Vice Minister Li Jun, China-U.S. Aviation Symposium, Beijing, April 2004.

¹³⁶ Consolidated estimate from Boeing, Airbus, CAAC, and industry analysts.

airlines. Traditionally, the Chinese government (through the China Aviation Supplies Corporation [CASC]) directs the purchase and distribution of imported aircraft among the various Chinese airlines. This practice is changing as Chinese airlines become more independent.

Future U.S. and European export prospects may be dampened to the extent that Chinese companies are able to satisfy at least some of this growing demand with indigenously produced aircraft. U.S. and European companies also may face new competition domestically and in other countries as Chinese manufacturers seek to expand their share of the global aircraft market.

Chapter 6 – Aerospace Trade Policy Overview

Some of the structural changes in the global aerospace industry are due to government policies, funding, and regulations. A strong aerospace industrial base supports national defense, technology development, scientific discovery, and high-wage manufacturing jobs, and contributes to export revenue and national prestige. The immense technical challenges and start-up costs associated with the aerospace industry limit the global industrial base to a handful of countries and a few major companies. National and local governments have a long history of intervening in their aerospace industries to help them grow and prosper in critical global markets.

Some governments have sought to encourage prospective buyers (often other governments) to purchase their companies' products at the same time as they restricted access to their own markets for foreign competitors through tariffs or regulations. Government financial assistance has been provided to help companies develop new products and technologies and to offer better prices to foreign buyers. Because of these factors, adherence to international trade rules governing aerospace industry trade is particularly necessary.

Since the 1970s, the United States has negotiated and entered into a number of major international agreements that have significantly liberalized trade of civil aircraft products and reduced government intervention in the civil aerospace market. Many of those agreements are specific to the aerospace industry, although some are not. The overriding objective of those agreements has been to lessen (if not eliminate) the influence of government actions and funding on the aerospace industry. There has been at least stated agreement among members that production and purchase decisions should be based on market dynamics, not government interference.

Four international agreements have the most significant and direct relevance to aircraft trade.

Agreement on Trade in Civil Aircraft

These open-market principles were laid out in the preamble and articles of the first major international agreement on commercial aircraft trade, the 1979 General Agreement on Tariffs and Trade (GATT) Agreement on Trade in Civil Aircraft (ATCA).¹³⁷ ATCA parties sought to liberalize international trade in civil aircraft, including large jet transport aircraft, by agreeing to:

- Eliminate tariffs on imported aircraft, engines and parts;
- Refrain from imposing quantitative import restrictions, such as quotas;
- Avoid using technical measures, such as standards, to unfairly restrict civil aircraft trade;
- “Seek to avoid adverse” trade effects in providing subsidies to aircraft manufacturers, recognizing the application of general GATT subsidies rules to the civil aircraft sector as well as “special factors” which are particular to civil aircraft; and

¹³⁷ Originally negotiated during the Tokyo Round of multilateral trade negotiations.

- Abstain from government influence over aircraft purchase decisions through incentives or “unreasonable” pressure on aircraft purchasers.

There are 30 parties (and a handful of observers) to the ATCA, including most of the major aerospace-equipment-producing countries in the world.

The U.S. and European governments had widely diverging views of how certain non-tariff provisions of the ATCA provisions should be interpreted. Regular consultations of the ATCA Committee did little to resolve their differences, leading to increasing tension between the U.S. and European governments.

1992 U.S.–EU Agreement on Trade in Large Civil Aircraft

After the United States successfully challenged a German exchange rate subsidy scheme at the GATT and then filed a broader case against EU subsidies to Airbus, the United States and the EU entered into the 1992 bilateral U.S.–EU Agreement on Trade in Large Civil Aircraft (1992 Agreement).¹³⁸ Among other things, this agreement attempted to give greater clarity to obligations in the ATCA regarding “unreasonable pressure”. Key provisions of the bilateral agreement included:

- Prohibition on support for the manufacturing, marketing and/or sales of aircraft (i.e. production support).
- Strict terms and conditions set on new “direct” development supports, including a “cap” of 33 percent of total development costs and specific repayment terms, with a requirement that a “critical project appraisal” be completed to demonstrate the commercial viability of the resulting aircraft under development.
- Discipline on “indirect support,” including a “cap” on identifiable benefits to commercial aircraft programs of government research and development funding.¹³⁹
- Explicit terms and disciplines on existing financial supports, allowing no modifications in existing programs.
- Clarification of disciplines on government intervention in aircraft marketing or procurement decisions.

¹³⁸ Agreement between the Government of the United States of America and the European Economic Community concerning the Application of the GATT Agreement on Trade in Civil Aircraft to Trade in Large Civil Aircraft, 1992.

¹³⁹ This includes research and development funding originating in all government funded civil and defense programs.

- Increased transparency of direct and indirect government support and government-funded research activities.

The agreement called for regular consultation between parties, and included a “peace clause” that the governments would not self-initiate trade action under their national trade laws.

WTO Agreement on Subsidies and Countervailing Measures

The 1994 WTO Agreement on Subsidies and Countervailing Measures (ASCM), while not specific to aerospace, applies in full to civil aircraft subsidies. All members of the WTO are bound by the ASCM. Among the key provisions of the ASCM relevant to civil aircraft subsidies are:

- Definition of a subsidy—defines “subsidy” as a financial contribution that confers a benefit on the recipient.
- Prohibited subsidies—prohibits subsidies that are contingent upon exporting the final product or upon the use of domestic over imported goods. It is not necessary for a complainant challenging a prohibited subsidy to demonstrate that the subsidy has adverse trade effects.
- Actionable subsidies—subsidies that do not fall within a prohibited category are nevertheless actionable if they cause adverse effects (e.g. material injury or “serious prejudice”) to the interests of another WTO member.

The ASCM includes transparency requirements and provides guidelines for determining the existence of a subsidy and its effects. In addition, it contains provisions for consultation and, if appropriate, retaliation by the injured party.

OECD Arrangement on Guidelines for Officially Supported Export Credits

The fourth international agreement, which specifically addresses government financial intervention in aircraft trade, is the Organization for Economic Cooperation and Development (OECD) Arrangement on Guidelines for Officially Supported Export Credits (the Arrangement). Established in 1978 in order to limit the competitive impact of government-supported export financing, the Arrangement defines terms and conditions for government direct loans, loan guarantees and other types of financial support to exporters. Government entities that provide such support are known as export credit agencies (ECAs).

ECAs play an important role in facilitating trade by reducing the financial risk of exports to foreign customers that lack sufficient financial resources themselves and are unable to arrange commercial financing because of poor credit conditions. However, ECAs could be a competitive factor in the marketplace if they were to offer overly generous financial support.

One of the Annexes to the Arrangement, the Sector Understanding on Export Credits for Civil Aircraft, establishes rules related to civil aircraft. The Annex is composed of three sections

dealing with (a) new large civil aircraft and engines for these aircraft, (b) all new aircraft except large aircraft, and (c) used aircraft, spare engines, spare parts, and maintenance and service contracts. Under the Arrangement, ECAs may support no more than 85 percent of the total aircraft value, requiring the airline to seek commercial financing for the balance of the purchase price. The Sector Understanding also establishes interest rates and sets the repayment terms at 12 years for large civil aircraft.

The terms of the Arrangement are established by consensus and participation is voluntary. There is no enforcement mechanism, although participants are encouraged to share information on programs that are not in line with the Arrangement.

The Participants to the Arrangement include all OECD members—primarily high-income countries—with official export credit agencies (ECAs). Though negotiated at the OECD, the Arrangement has broader implications beyond OECD members. The World Trade Organization (WTO) Agreement on Subsidies and Countervailing Measures (ASCM) states that: (1) ECAs must charge fees sufficient to cover long-term operating costs and losses; and (2) ECAs that follow the interest rate provisions of the Arrangement are not considered prohibited export subsidies.¹⁴⁰

6.a. U.S. Trade Policy

The principles outlined in these four agreements reflect the fundamental principles underlying U.S. trade policy in general, and civil aircraft trade policy in particular. The United States seeks to achieve the exercise of free-market forces to the greatest extent possible in the context of reciprocity between trading partners. A key objective of U.S. civil aircraft trade policy is to promote greater opportunities for U.S. exporters by reducing or eliminating market access and investment barriers abroad. U.S. government objectives in civil aircraft trade negotiations conducted in the GATT and WTO call for the United States to obtain competitive opportunities for U.S. exports “substantially equivalent” to those afforded foreign products in the United States. Further, they call for the United States to maintain “vigorous and effective” disciplines on subsidies practices and seek to eliminate tariff and non-tariff barriers to trade in civil aircraft.¹⁴¹

U.S. government civil aircraft trade policy reflects the relationship between the U.S. government and the private sector. U.S. manufacturers of civil jet aircraft, aircraft engines, and civil aircraft components are privately owned companies that operate independently of government financial control. The government does not dictate commercial aerospace business decisions made by Boeing or any other manufacturer. U.S. manufacturers do not seek—and the U.S. government does not offer—approval concerning the type of aircraft or engines they should build, how they choose their suppliers and the nature of their contractual relationships, and what marketing strategies they should pursue. U.S. airlines, all privately owned, make aircraft purchase decisions free of any influence from the U.S. government.

¹⁴⁰ WTO Agreement on Subsidies and Countervailing Measures, Annex 1, items j and k.

¹⁴¹ Provisions of the Uruguay Round Agreements Act (P.L. 103-45) specific to civil aircraft (Section 135[c]).

The United States was the driving force behind the creation of the ATCA in 1979. The United States has encouraged new WTO members to sign up to the ATCA, and has offered technical advice to new members on creating transparent processes for allowing duty-free access to aerospace products. The United States also drove development of the 1992 U.S.–EU Agreement to address issues that were not being satisfactorily resolved under the ATCA or the old (pre-WTO) subsidies code that existed at the time.

The administration of U.S. trade policy is generally transparent. The U.S. government respects the right of public participation by soliciting comments on proposed rules and regulations, providing detailed reports on proposed and completed government purchases, and conducting open hearings. European and other U.S. trading partners generally have the same access to information concerning U.S. civil aircraft trade issues as does the U.S. public at large.

6.b. European Trade Policy

In contrast, the role of government in directing and participating in the economy is more widely accepted in Europe. European governments continue to have a direct financial interest in European aerospace manufacturers and airlines, although many state-owned aerospace companies have been fully or partially privatized over the last several decades. As a result, European government trade policy reflects, in part, the view of a market participant. Nonetheless, European governments certainly have publicly and privately affirmed their goal of liberalizing global aerospace markets. They are parties to the above mentioned (and many other) trade policy agreements, and represent a central force in the WTO.

Measures practiced by the European Commission and individual EU member state governments have given rise to the appearance of a coordinated strategy aimed at boosting Airbus's competitiveness, at the expense of Boeing, across many fronts. Given that Airbus and EADS are amalgamations of national aerospace companies, cabinet-level officials from European governments coordinate their aerospace trade policies (sometimes noted as meetings of the "Airbus ministers"). The result of this coordination appears to be a pan-European strategy linking together the efforts of individual European governments to support their industries. Historically, European aerospace trade and industrial policies have not been as transparent as those in the United States. Recently published reports by European government and industry executives described in Chapter 2, including the *STAR-21*¹⁴² and the *Vision:2020*¹⁴³ reports, provide more detailed insight into European aerospace policy objectives. They illustrate European government intentions to use government resources to pursue global leadership by European aerospace firms.

EU governments have in the past supported these efforts through such measures as equity infusions to boost aerospace manufacturers' operating capital, and subsidies that EU manufacturers have used to launch new product lines. These actions speak to the fundamentally

¹⁴² *Strategic Aerospace Review for the 21st Century (STAR-21)*, July 2002.
http://europa.eu.int/comm/enterprise/aerospace/report_star21_screen.pdf

¹⁴³ *European Aeronautics: A Vision for 2020*, January 2001.
<http://europa.eu.int/comm/research/growth/aeronautics2020/en/index.html>

different philosophies of Americans and Europeans on the relationship between government and industry, and are the root of many of the disagreements and different interpretations of provisions of the agreements.

6.c. Competitiveness Impact

Trade agreements have done much to liberalize and level the international playing field for the aerospace industry. Most notably, parties to the ATCA enjoy duty-free trade of the more than 250 products included in the Agreement's Annex. As a result, tariffs have declined in importance as an increasing number of countries reduce or eliminate altogether tariffs on aircraft, engines, and parts. However, non-tariff barriers (intentional or not) accordingly play an increasing role. The level of government intervention across the board has declined with the signing of each successive agreement, but weaknesses and areas of dispute still remain. Many provisions of these agreements are becoming outdated for an increasingly global industry.

Chapter 7 – U.S. and European Government Support

7.a. Financial Support

Government funding for aircraft-related research and development (R&D) has been the single greatest source of trade friction in the civil aerospace industry. U.S. and European officials have sought to alleviate their concerns by negotiating increasingly stringent disciplines on all types of R&D funding ranging from launch aid to basic research. The ATCA parties pledged to “seek to avoid the adverse effects” of such funding. The 1992 Agreement set explicit limits on various types of funding. The ASCM prohibits some subsidies and establishes strict rules for taking action on others. Unfortunately, these agreements have failed to resolve concerns about government funding for new aerospace products. European governments continue to fund development of new commercial aircraft models, something that the U.S. government believes should be left to private markets and commercial considerations.

Launch Aid

European government-targeted funding for development and introduction of new civil aircraft and engines (often referred to as launch aid subsidies¹⁴⁴) has created the marketplace that exists today. The creation of Airbus as a European consortium was at the direction of the French, German, British, and Spanish governments (some of which owned part or all of the member companies) in an effort to end the market domination of U.S. aerospace manufacturers. Those governments paid for between 75 percent and 100 percent of the total costs of development of Airbus’s original product line. Many of Rolls-Royce’s early commercial aircraft engines were developed when it was owned by the government of the United Kingdom. Periodic equity infusions to struggling companies further helped to keep companies financially solvent as they sought (and achieved) ever increasing market share.

Over the years, this funding has changed from direct grants to reimbursable advances, also known as royalty-based financing (RBF). These advances are not like typical commercial loans. For one, they carry preferential, below-market government interest rates and not prevailing commercial rates.

Moreover, repayments of the advances are contingent upon sales. The government is paid a set royalty for each aircraft or engine sold, according to terms established when the funding is committed. If the aircraft model fails to reach market forecasts, the loan is not fully repaid. Unlike typical commercial loans, royalty-based financing does not require constant repayments, and is not underwritten or secured by company assets or by cash flow unrelated to the model under development. In essence, the governments assume a portion of the market risk of developing a new product, with the side effect of improving the credit rating of the borrower with respect to other financial instruments and liabilities.

¹⁴⁴ The EC and member states use different terms to describe this type of funding such as launch aid, launch investment, *avances remboursables*, *Rueckzahlbare Zuwendungen*, *Entwicklungsbeihilfen*, *Zuschuesse zur Entwicklung von zivilien Flugzeugen*, *anticipo reembolsable*, and *prestamo reembolsable*.

While the 1992 Agreement was intended to limit support, with a view toward eliminating it, it has instead served to perpetuate subsidies. European government officials have cited the 1992 Agreement as a rationalization to continue the subsidization of Airbus. Every major Airbus aircraft model has been wholly or partially funded with launch aid, including three new models developed since 1992—the A330-200, the A340-500/600, and the A380.¹⁴⁵ The Airbus A380 is the latest beneficiary of European launch aid. Nine governments--France, Germany, the United Kingdom, Spain, the Netherlands, Finland, Belgium, Italy, and Sweden--are providing nearly \$4 billion of the total \$12 billion (approximately € 8.95 billion¹⁴⁶) of anticipated development costs for the 555-seat aircraft. Airbus CEO Noel Foregard even announced that Airbus would ask for nearly €1 billion in launch aid for their next aircraft, the proposed A350, “because it is available” and even though Airbus reports to have the cash reserves to finance it internally.¹⁴⁷

Launch aid limits the financial risk to Airbus of launching new aircraft and reduces the company’s investment of internal capital needed for new programs. As a result, Airbus is able to receive better terms when securing additional capital in private financial markets. As one example, Moody’s cited the government reimbursable advances for development of the A380 as a leading consideration in its high credit rating of EADS when the newly formed company first floated shares on the open market.¹⁴⁸ Lower capital costs enable Airbus to offer lower relative prices to customers and win market share. All announced orders for the new A380 reportedly were at heavily discounted prices.¹⁴⁹ It is typical for launch customers of new aircraft to receive discounts as an incentive to sign up early, but certainly the level of discounts offered would take into account the cost of capital investment by the company. Exact details are difficult to ascertain given the commercial proprietary nature of sales contracts and the lack of full transparency of Airbus’s financial records.

The growth of Airbus, fueled in large part by European launch aid, has been remarkable. Launch aid fully or partially covered the development costs of the A300, A310, A320, A330, and A340. The first Airbus rolled off the assembly line in 1974. By 1992, Airbus was producing one of every four new large civil aircraft in the world, and had a third of all future large civil aircraft deliveries on its order books. Starting in the 1990s, Airbus periodically surpassed Boeing in new announced aircraft orders. In 1997, McDonnell Douglas essentially exited the commercial aircraft business and merged with Boeing. In 2003, Airbus delivered more aircraft than Boeing for the first time.

Airbus is not the only European civil aerospace manufacturer to benefit from launch aid. The U.K. government also has offered royalty-based financing to Rolls-Royce PLC for development of new aircraft engines sold on both Airbus and Boeing aircraft. Most recently, the U.K. government committed to providing approximately \$363 million to Rolls-Royce in reimbursable

¹⁴⁵ “Key determinants of competitiveness in the global large civil aircraft market: An Airbus assessment,” Airbus Industrie, August 2002.

¹⁴⁶ Calculated exchange rate of 1 Euro = US \$1.34065, average exchange rate for December 2004, www.x-rates.com

¹⁴⁷ “Unrepentant Airbus seeks further launch aid,” *The Independent (U.K.)*, October 15, 2004

¹⁴⁸ *Moody’s Fundamental Credit Research Opinion Update*, June 8, 2001.

¹⁴⁹ “Mega Plane,” *Business Week*, November 10, 2003.

advances to develop the Trent 900 (for the A380) and another engine program that subsequently was cancelled. Aircraft engines are not covered by the 1992 Agreement and therefore are not subject to the 33-percent direct support cap. Nonetheless, they still are subject to subsidies provisions in the ATCA and the WTO subsidies agreement (ASCM).

U.S. engine manufacturers have suffered significant loss of market share to Rolls-Royce in recent years. Rolls-Royce reportedly has offered extraordinary discounts to achieve new orders and increase its market presence. As with new aircraft programs, list-price discounts for early launch customers of new engine programs are quite common. Nonetheless, lower cost of capital either means lower prices for customers or higher corporate profits.

The United States has called on European governments to cease providing launch aid, citing the fact that Airbus is a mature company that has successfully captured more than half the global market, as measured by the number of aircraft delivered. Airbus and EADS have the financial leverage to fully finance the development of new commercially viable programs, tapping internal and market resources.

Unfortunately, though, European governments continue to offer financial assistance. Airbus accepts it without domestic public backlash. It is a political expectation shared by the electorate—the need to commit public support to a critical endeavor. It remains to be seen in future financial reporting if Airbus management is becoming more market-oriented, or if Airbus will continue to also be driven by national/political goals and the pursuit of market share—at the expense of shareholder value.

Royalty-based financing for new aircraft engine programs in Europe may be coming to an end. There has been no announcement of new reimbursable advances offered by the U.K. government for Rolls-Royce's newest engine model—the Trent 1000—to be used on the Boeing 787. Although the Trent 1000 is a derivative of the high-thrust Trent engine family rather than an entirely new engine model,¹⁵⁰ this decision is a welcome step in the right direction.

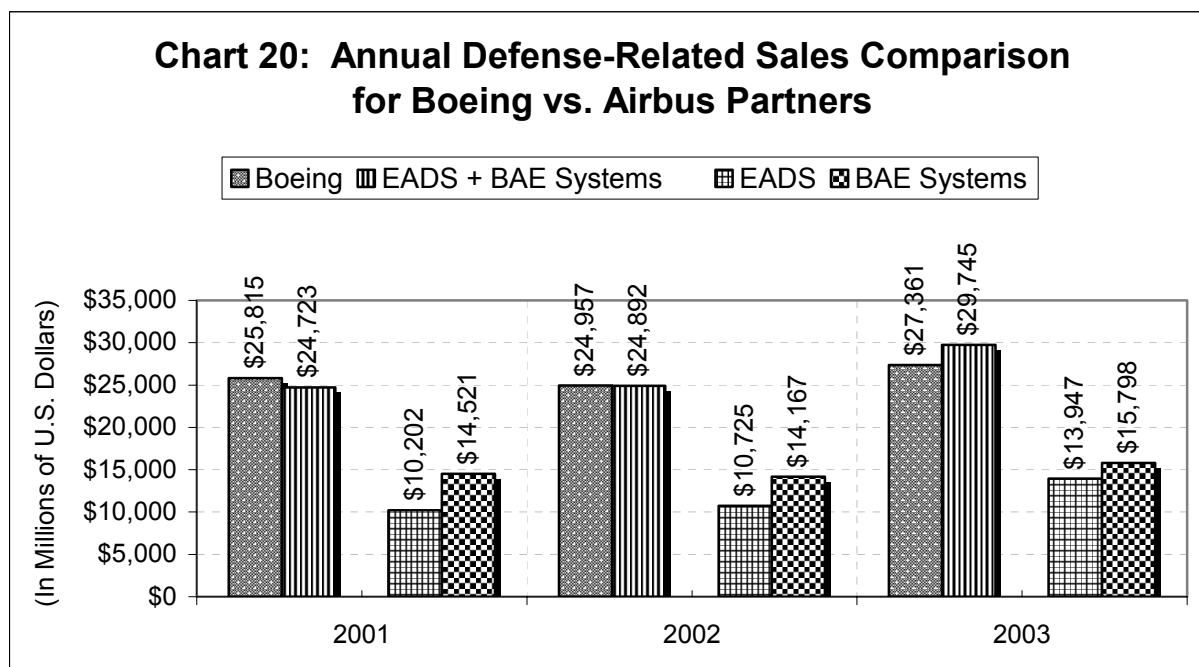
In contrast to European governments, the United States does not offer loans or launch aid to U.S. aerospace companies for new aircraft development programs. This is a matter of longstanding policy and practice. The U.S. government has declined to provide equity infusions or other similar support to maintain production of large civil aircraft models, instead allowing companies to exit the market (Lockheed Martin) or merge with other companies (McDonnell Douglas) based on commercial considerations. There is little appetite in government circles to alter this approach.

Military R&D

There are two major misconceptions about the relationship between military aeronautics funding and LCA development programs. First, European officials claim that Boeing must have a significant competitive advantage over Airbus, based on a simple comparison of U.S. and European aggregate government defense budgets. However, Boeing and Airbus-family

¹⁵⁰ “Pratt odd man out on 7E7; Boeing chooses GE, Rolls engines”, *Air Transport World's ATWOnline*, April 7, 2004. www.atwonline.com/indexfull.dfm?newsid=4046

companies actually are similarly positioned in military markets. Boeing builds or participates in production of fighters (current and past examples include the F-15, F-18, and a partnership on the F-22), trainers, bombers, aerial refueling tankers, and cargo aircraft, as well as helicopters and missile systems. BAE Systems, EADS and Construcciones Aeronáuticas S.A. (CASA) lead or participate in their own military aircraft and missile programs in each of these categories, including the Eurofighter, Gripen fighter aircraft, BAE Hawk, A400M transport aircraft, and the proposed AirTanker. BAE Systems is even a key and welcome partner in development of the next-generation U.S. Joint Strike Fighter.



Source: U.S. Department of Commerce analysis of company financial reports

In fact, as shown in Chart 20, Airbus parent companies EADS and BAE Systems, which are Europe's two largest defense contractors, together generate more revenue from defense operations than does Boeing Commercial Airplane Group's parent entity, The Boeing Company. Although U.S. defense procurement and military research budgets certainly exceed European budgets, this funding is divided up among many more companies in the United States (including large companies such as Lockheed Martin and Northrop Grumman, which partner with EADS and BAE Systems on U.S. military programs).

Second, European claims of U.S. benefits to LCA programs resulting from military programs are vastly overstated. They include government expenditures that have no relevance to large civil aircraft programs. As evidence of so-called massive support for commercial aircraft programs, they cite aggregate DOD contract awards to Boeing for military R&D, services, supplies and equipment, any use by Boeing of DOD-owned test facilities, and even government personnel costs associated with any of these programs, contracts, or facilities.

In addition, European officials for decades have incorrectly claimed that 25 percent to 50 percent of aggregate DOD-funded RDT&E carried out by Boeing (and a smaller percentage of RDT&E contracts carried out by other companies) should be considered indirect support to Boeing large civil aircraft programs.¹⁵¹ First offered in a 1988 report by Airbus, these allegations have changed little over the last 15 years. The formulas upon which they are based contain factual and methodological errors. Perhaps most important, they appear to have little relevance for today's industry. The calculations are based on assessments of civil and military aircraft developed in the 1950s (the Boeing 707) and the 1960s (Boeing 747), as well as the anticipated crossover of technology from military fighter aircraft to supersonic and hypersonic civil transport aircraft that were never built.¹⁵²

Today more than ever, technologies developed for the military sector are highly specialized and hold little near term value for the civil sector. Most defense R&D funding is mission-specific and earmarked for a higher level of development, testing, or evaluation.¹⁵³ It is targeted to military avionics, system controls, sensors, and communications; stealth technologies; the aerodynamics of fighter and special-mission aircraft; and other defense uses. New technologies originating from defense research commonly fall under export controls, which preclude (often for decades) their availability for the global civil aircraft market.

Some higher-order technologies and skills such as systems integration could have an impact on civil programs, especially as U.S. and European manufacturers are moving toward a systems approach to manufacturing and airspace operation. Nonetheless, the value of the military sector to successful civil operations may be nominal. Lockheed Martin, the world's largest defense contractor, got out of the civil aircraft business. Boeing, which became the world's largest manufacturer of civil aircraft, was a minor Pentagon contractor before acquiring McDonnell Douglas. At the time, MD had a struggling line of civil aircraft but was the second-largest defense contractor in the United States.

Civil R&D

Similar misperceptions persist in policy discussions about civil aeronautics basic research funding. European launch aid is frequently touted as necessary to counterbalance U.S. civil R&D support. In fact, governments on both sides of the Atlantic provide funding for civil aeronautics research and development. However, there are important differences in the nature of the research that is conducted in the United States and in Europe, the criteria for industry

¹⁵¹ *Government Funding of Boeing and McDonnell Douglas Civil Aircraft Programs*, Airbus Industrie, March 1988; *U.S. Government Support of the U.S. Commercial Aircraft Industry, Prepared for the Commission of the European Communities*, November 1991; various exchanges of information between U.S. and European government officials.

¹⁵² "U.S. Government Response to EC Charges [of U.S. Government Support of the U.S. Commercial Aircraft Industry]", U.S. Department of Commerce news release, March 10, 1992.

¹⁵³ The total Department of Defense FY2005 budget for research, development, testing and evaluation was \$68.9 billion. Almost all is mission-specific—only \$5.2 billion, or 7.5 percent, is earmarked for basic or applied research and would have potential applicability outside the military. The vast majority of the RDT&E budget is for advanced technology or component development, prototypes, system development and demonstration, management support, and operational systems development.

participation in the research activities, company access to research results, and even aggregate funding levels.

The other major misconception is the nature and impact of civil aeronautical R&D funding on LCA programs. European allegations about U.S. programs are based on factual and methodological errors similar to those in the dispute over military spending. European calculations of U.S. government civil R&D funding provided to Boeing are overstated. They are based on aggregate federal aeronautical research budgets, regardless of the research topics (e.g. including non-LCA-related projects) or even whether Boeing participates in the research activity. They also include federal procurements of aerospace products as well as federal personnel and infrastructure costs.

The purported benefit of this spending is further inflated by estimates that a significant percentage of aggregate aeronautical expenditures constitute a benefit directly (and exclusively) to Boeing. A 1991 EC-commissioned study estimated this percentage to be 90 percent, apparently based on a 1982 assessment conducted by the White House on early aircraft programs.¹⁵⁴ Subsequent estimates provided by the European Commission of this percentage of benefit have varied significantly, although the methodology for deriving the percentages has not been provided.

Focus of Research Programs

The primary source of U.S. government civil aeronautical funding is NASA.¹⁵⁵ NASA and the Federal Aviation Administration (FAA) collaborate on their highest research priority: developing a next-generation national air transportation system that will improve capacity, efficiency, and safety. As the first of four goals in NASA's 2002 *Aeronautics Blueprint*, the related technologies under development are intended to improve weather forecasting, optimize traffic flows, lead to efficient surface movement at busy airports, and improve communication, navigation, and surveillance of aircraft. The research aims to increase capacity by decentralizing the architecture and increasing the capability of aircraft to autonomously avoid protected airspace. The system would rely on the Global Positioning System for precision approaches to runways without reliance on ground-based equipment at every airport, large and small.

NASA's second research goal, aviation security, is a new role for NASA. This line of research focuses on concepts and technologies that would protect aircraft and the airspace system from criminal and terrorist threats. The primary user and beneficiary of the technologies resulting from these first two areas of research is not industry per se, but the U.S. government itself. Of course, improvements to traffic flow and security benefit the traveling public as well as manufacturers on both sides of the Atlantic.

¹⁵⁴ *U.S. Government Support of the U.S. Commercial Aircraft Industry, Prepared for the Commission of the European Communities*, November 1991, citing Office of Science and Technology Policy, Executive Office of the President, *Aeronautical Research and Technology Policy*, Vol. 1: Summary Report, November 1982.

¹⁵⁵ NASA and FAA budgets. Historical funding figures and analysis also provided in *Competitive Assessment of the U.S. Large Civil Aircraft Aerostructures Industry*, ITC Publication 3433, Investigation No 332-414, June 2001,

NASA's other targeted areas of research are intended to benefit a broad cross-section of U.S. industry. Goal three is a series of academic partnership programs to help stimulate the interest of young people in aerospace and prepare a competent work force to replenish an industry in which the average employee is over 47 years of age.

The fourth goal of NASA is to help develop revolutionary vehicles. While NASA research on public-good issues such as safety and the environment can be intended either for long-term or near-term results, investments in aeronautical vehicle research are strictly long-term.

Technologies with application horizons many years in the future are chosen.¹⁵⁶ At the vehicle level, research is now focused on advanced concepts, particularly unmanned aerial vehicles (UAVs). High-altitude UAVs are envisioned for reconnaissance (security and infrastructure protection), hazardous work, weather forecasting, communications, and weapons platforms.

At the vehicle component level, NASA research includes noise and emissions reduction, fuel/propulsion efficiency, and safety improvements. It is working on breakthrough technologies in composites that would vastly improve structural strength-to-weight ratios, and in advanced aerodynamics for more efficient and simpler flight control. Any of these improvements could certainly rate as a competitive factor, but not for near-term application.

The FAA is the other major U.S. government source of civil aerospace-related R&D funding. FAA research generally is focused on safety and the environment, and not on the development of new vehicles. Currently, FAA programs are focused on the following subjects: weather research; flight deck and system integration-human factors; air traffic control and airway facilities-human factors; aero-medical research; airport technology; aviation safety risk analysis; fire research and safety; propulsion and fuel systems; advanced materials/structural safety; flight safety/atmospheric hazards; aircraft catastrophic failure prevention; aging aircraft airframe structures; and aging aircraft non-structural systems.

European member states historically have funded aerospace and aviation research through national organizations similar to NASA and the FAA.¹⁵⁷ In practice, their basic research often focuses on improving competitiveness and on developing specific technologies. In essence, it is directed at the market. Although the national authorities in the past set their own priorities and funding levels, many of these programs focused on technologies that eventually would be incorporated into vehicles produced by pan-European companies such as Airbus. Just as Airbus member companies divided the responsibility for producing specific components, assemblies, or parts for integration into a single aircraft, Airbus member governments focused their research on technologies related to the contributions of their respective companies.

One prime example is Germany's \$353 million Aviation Research Program 1995–1998. Although the program's initial focus was smaller aircraft, "due to structural changes in the aircraft industry . . . the program geared its major projects to the longer-term product spectrum of

¹⁵⁶ "A Review of Aeronautics R&D at FAA and NASA," Jeremiah F. Creedon, Associate Administrator for Aerospace Technology, National Aeronautics and Space Administration (NASA), at a hearing before the Subcommittee on Space and Aeronautics, Committee on Science, House of Representatives, March 6, 2003.

¹⁵⁷ For a more extensive discussion of national research laboratories, see *Competitive Assessment of the U.S. Large Civil Aircraft Aerostructures Industry*, ITC Publication 3433, Investigation No 332-414, June 2001.

the Airbus family, with the main emphasis on large aircraft.” One third of the research funds were allocated to research of the Megaliner 2010, an aircraft with the same basic parameters as the A380. The Megaliner program covered a wide variety of topics, such as aerodynamic resistance, dynamics of flexible aircraft, high lift systems, passenger systems, laminated rudder units, and new fuselage technology. One quarter of the research funds were allocated to the Eurojet 2010 program for jets with more than 70 seats. However, research project descriptions frequently made specific reference to Airbus aircraft such as the A320, A340, the A3XX (now called the A380), and a 100-seat aircraft. Only German firms and research institutions participated in the projects.¹⁵⁸

Aerospace and aviation research in the European Union is increasingly coordinated and funded through so-called “framework programs”, and recently through establishment of a European Strategic Research Area for Aerospace. Member-state research laboratories are increasingly reliant upon EC funding for their research. The Sixth Framework Program for Research, Technology Development and Demonstration Activities (FP6), which runs from 2002 to 2006, is the most recent in an ongoing series of five-year framework programs through which the EU promotes transnational R&D in Europe. *Aeronautics and Space* is one of seven research themes identified as strategically important to Europe’s future.

There are many similarities among the high-level research areas established in the FP6 aerospace agenda and those areas of focus for NASA and FAA. The FP6 subthemes are listed in the following order: strengthen competitiveness by reducing development and aircraft direct operating costs and improving passenger comfort; improve the environmental impact with regard to emissions and noise; improve aircraft safety and security; and increase operational capacity and the safety of the air transport system.

The key difference in priorities is the competitiveness subtheme of the FP6. The leading FP6 aerospace objective is “to strengthen, by integrating its research efforts, the scientific and technological bases of the European aeronautics and space industry and encouraging it to become more competitive at [the] international level.”¹⁵⁹ Its goals are to improve the competitiveness of European civil aircraft, engines, and equipment by reducing aircraft development costs and their direct operating costs by 20 percent to 50 percent. Specific areas of focus are advanced modeling, improved manufacturing processes, cost-effective aerodynamic designs, structural and equipment weight reductions, propulsion efficiencies, improvements to the cabin environment, crew workload automation, better onboard passenger services, flight-testing services, and new aircraft concepts.

¹⁵⁸ *Program for aviation research and technology (Programm Luftfahrtforschung und –technologie) 1995-1998*, Deutsche Agentur für Raumfahrtangelegenheiten (DARA) GmbH, Germany Federal Ministry for Education, Science and Research and German Ministry for Industry.

¹⁵⁹ <http://fp6.cordis.lu/fp6/home.cfm>

Participation and Access to Results

The differences between U.S. and European priorities are further evident in the criteria for deciding which specific activities to fund and determining access to the resulting technology. In the area of air transportation, NASA's research is handed off to the FAA or other agencies as appropriate for implementation. Vehicle-related research is intended to result in high-risk, revolutionary leaps in pre-commercial technologies in which the private sector would only modestly invest. In some cases, the resulting technology will not be commercialized. However, that is the nature of this type of investment of public money in instances where private funding is not available.

Private-sector companies, including Boeing and other aerospace manufacturers, participate in many of the FAA and NASA research projects. However, the results of most federally funded U.S. civil aeronautical research are made available to the public. Except in limited circumstances when the contributions of company proprietary information may warrant an exception, the results of taxpayer-funded research do not become the property of the research participants. It is placed in the public domain for fairness to all market competitors, U.S. and European alike.¹⁶⁰ To pursue these utilitarian goals most effectively, U.S. agencies purposefully make the results of their research available to the broadest possible audience. That is true of both FAA research, in which foreign companies may participate, and NASA research, in which only U.S. firms can be prime contractors. Both Airbus and Rolls-Royce PLC have participated in FAA research and development programs. In fact, some FAA research has been specifically focused on challenges unique to Airbus, such as studies of airport infrastructure and wake-vortex issues related to operation of the A380. Rolls-Royce indirectly has participated in NASA research programs through their North American subsidiary Rolls-Royce North America (formerly the Allison Engine Company).

In contrast, European national research labs and the European Commission increasingly are focused on funding R&D projects intended to give European companies a competitive advantage in global markets. FP6 research specifically is conducted by European companies, national laboratories, or members of academia selected to assemble and lead a consortium to perform a specific work program. The three leading program funding justification requirements focus on integrating European research activities and resources, which establishes a bias against non-European (i.e., U.S.) participation and empowers consortium leaders to restrict U.S. company participation. This bias is further strengthened when research is conducted under the competitiveness subtheme.

In early 2002, the European Commission (EC) invited potential consortium leaders to submit expressions of interest (EOI) for the purpose of developing work programs under FP6. Of the 378 completed EOIs received under the aeronautics theme (without space), more than half fell under the competitiveness subtheme. Airbus and Rolls-Royce submitted EOIs on projects to reduce manufacturing costs and increase competitiveness. If the EOIs are any indication, the EC may well dedicate more than half of the billion euros for FP6 aerospace research to fund work programs flowing from the first real objective of the aeronautical and space theme: to develop

¹⁶⁰ The popular fly-by-wire technology that is replacing hydraulic pilot controls was developed in the United States, but first utilized and marketed effectively by Airbus.

near-market products and services that will better compete against U.S. industry in the global marketplace.

Consistent with this goal, FP research results become the property of the consortium participants who carry out the work. U.S. industry access to the results is contingent on participation, which appears to be limited to the minority of programs where the focus is on noncompetitive technologies. The majority of EU funding of civil aeronautical research is clearly intended to develop new products for near-term application in the large civil aircraft market that will compete against U.S. products. In practice, it is essentially directed at the market.

Funding Levels

Differences between U.S. and European government aerospace-related R&D funding priorities are compounded by diverging levels of funding. According to NASA, U.S. industry and government spending on aeronautics research and development has declined by around 50 percent since its peak in 1987.¹⁶¹ The NASA aeronautics budget will decline further from \$946 million in FY 2004 to a proposed \$919 million in FY 2005. Ten years ago, 87 percent of total NASA aeronautical funding was directed to vehicle development. Today, with the increasing emphasis on aviation safety, security, and airspace management, it has dropped to 60 percent. The FY 2005 aeronautics vehicle systems budget of \$577 million sets aside only 32.5 percent, or \$187 million, for procurement and R&D contracting. The remainder pays for NASA personnel, administrative expenses, and infrastructure costs.

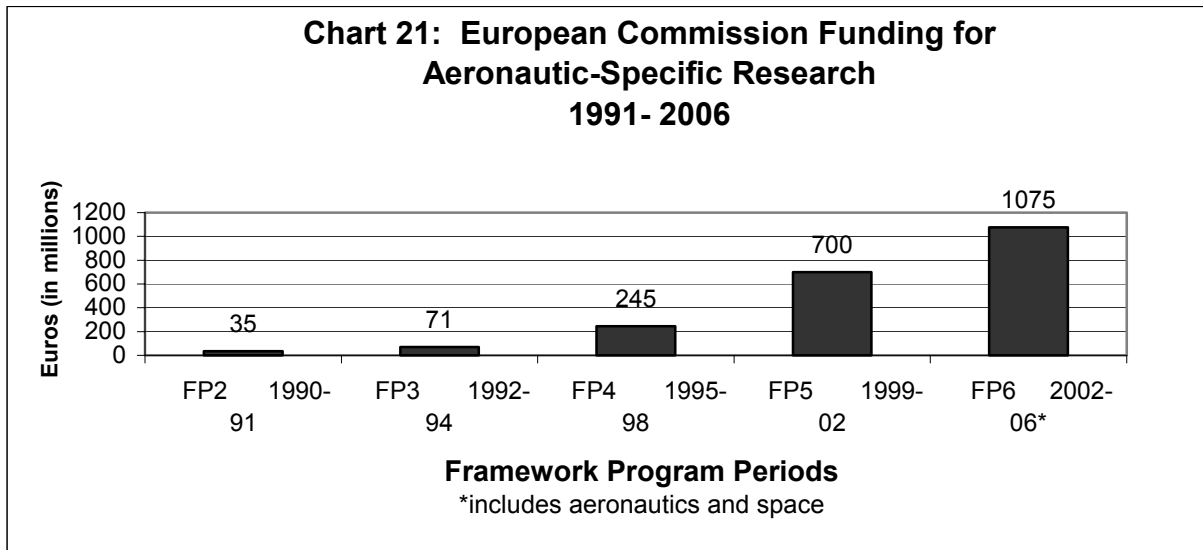
European Commission funding for aeronautics research is on the rise, as indicated in Chart 21.¹⁶² The FP6 *Aeronautics and Space* research theme drew total funding of €1.182 billion (approximately U.S. \$1.6 billion¹⁶³) over four years (with about 75 percent expected to be spent on aeronautics research), up from €700 million (approximately U.S. \$629 million¹⁶⁴) funding for aeronautics in the previous framework. Almost the entire FP5 budget—€645 million out of a total €700 million budget—was allocated to vehicle development and technology platforms. The percentage of total FP6 funds allocated to vehicle and technology development will depend upon the research proposals submitted for the European Commission's approval.

¹⁶¹ *The NASA Aeronautics Blueprint - Toward a Bold New Era of Aviation*, National Aeronautics and Space Administration, February 2002. p. 12.

¹⁶² *The Competitive and Sustainable Growth Programme (FP5): 1998 - 2002 Project Synopses: New Perspectives in Aeronautics*, European Commission – Research. http://europa.eu.int/comm/research/growth/pdf/aero_synopsis-201102.pdf

¹⁶³ European Commission FP6 Indicative Budget for Aeronautics and Space, www.cordis.lu/fp6/aerospace.htm; calculated exchange rate of 1 Euro = U.S.\$1.34065, average exchange rate for December 2004. www.x-rates.com

¹⁶⁴ “New Perspectives in Aeronautics: 1998 – 2002 Project Synopses,” European Commission FP5 http://europa.eu.int/comm/research/growth/pdf/aero_synopsis-201102.pdf; calculated exchange rate of 1 Euro = U.S. \$0.898313, average exchange rate for December 2000. www.x-rates.com



Source: European Commission - Research

Some of this increase in EC funding draws from former national programs. In fact, European national laboratories now frequently look to the framework programs (FP) for funding. Nonetheless, these increases in EC funding have been supported by repeated calls by European government officials, industry executives, and blue-ribbon panels to increase and better coordinate civil aeronautical R&D funding to help counter overall U.S. funding and ensure the survival, ascendancy, and eventual superiority of the civil sector. In almost every context, success is measured in terms of competitiveness with U.S. industry.

Infrastructure Programs

Programs related to infrastructure development are another type of government financial support to aerospace manufacturers covered by multiple trade agreements. Many government entities in the United States and in Europe provide tax relief or other incentives to encourage local and regional development. These incentives usually are not specific to aerospace companies, but instead are available to any companies that create jobs and boost the local economy by investing locally. These programs often provide income or sales tax relief for companies realized only at the time that products are delivered from the new facilities, and do not assume financial risk for development or manufacture of new products.

U.S. and European aerospace manufacturers alike have taken advantage of financial incentives by local U.S. authorities to lure local investment. Boeing received tax incentives from the city of Chicago, the local taxing authorities, and the state of Illinois following the relocation of their corporate headquarters to Chicago. These incentives were reported to be similar to the incentives offered or provided to other companies the size of Boeing. Boeing reportedly stands to benefit from tax relief from the state of Washington based on deliveries of the new 787 from local manufacturing facilities.

Airbus itself has sought and obtained financial incentives from U.S. states and cities in return for locating facilities in those jurisdictions. For example, Dade County provided Airbus

approximately \$6.6 million in incentives for establishing a training facility near Miami International Airport¹⁶⁵, and Louisiana state and local authorities granted EADS approximately \$5.8 million to help EADS build a new aircraft hanger.¹⁶⁶ EADS currently is seeking financial incentives from several U.S. states in return for locating its proposed AirTanker production facility in the United States. The dollar value of the incentives to Boeing and Airbus appear to be linked to the economic value of the local investment by the respective companies. The larger the investment in local facilities and worker, the larger the incentives offered by the state or locality.

However, some infrastructure supports have been provided in Europe that specifically relate to production of particular aircraft models. Such production supports were explicitly prohibited in the 1992 Agreement. Most recently, the Airbus A380 program is the beneficiary of assistance at the European state/provincial and local government levels. The U.S. Department of Commerce estimates that more than \$1 billion was separately committed to road improvements to Toulouse (France), a landfill extension of the Hamburg (Germany) airport runway, a new A380 plant in Toulouse, and Airbus plant expansions in Hamburg (Germany), Broughton (United Kingdom), Andalusia (Spain), and Nantes (France).¹⁶⁷

Conclusions

International trade disciplines have failed to sufficiently limit EU government financial support for research and development of aerospace products. The distortions caused by this support range from direct loans and grants for aircraft or engine development, to funding of infrastructure associated with production facilities, to differing approaches to basic research. The real distortion of launch aid is in its mitigation of risk; one third of the development costs for new Airbus aircraft and derivatives are provided with no risk to Airbus. Such contingency-based repayment is not available in regular commercial markets. The mitigation of financial risk has a significant impact on decisions to design and produce new models of LCA, given the typical four- to five-year development cycle for a new LCA model and the 10 to 12 years of production required to recoup the manufacturer's capital investment. Airbus has used these subsidies to launch planes in rapid succession, even in low-demand market segments, and to quickly introduce new model derivatives while maintaining a healthy balance sheet.

The distorting effects of launch aid are exacerbated by diverging levels of funding for civil aeronautical research budgets in the United States and Europe. Apart from the research areas of safety and environmental technologies, the nature of U.S. and EU basic aeronautical research is fundamentally different. While Europe's primary research goal is to develop near-market

¹⁶⁵ "Airbus to Build Training Center near Miami International Airport," *Miami Herald*, October 13, 1997.

¹⁶⁶ "Foster touts grant for economic development," *The Times-Picayune*, November 3, 2002.

¹⁶⁷ *Le Figaro*, November 27, 2000; *Le Monde*, February 14, 2003; *Les Echos*, December 29-30, 2000; *Frankfurter Allgemeine Zeitung*, September 6, 2000; *North West Business Insider* (U.K.), June 2001; *Daily Post Liverpool* (U.K.), July 22, 2002; *ATI*, July 9, 2002; *Les Echos*, June 19, 2002; *Reuters*, Oct. 9, 2001; *Les Echos – Ind*, October 20, 2002; *Empresa XXI*, October 1, 2002, cited in *Euro Daily Media Monitoring*, October 11, 2002; *Europa Press* February 27, 2002; *Reuters*, October 20, 2004.

products to compete against incumbent U.S. products, the leading focus of U.S. research is on revolutionary advances in air traffic management and unmanned vehicles.

Also fundamentally different is the access to U.S. and EU research results. The United States and Europe may limit foreign participation in their research programs, but fair competition is particularly compromised by unequal access to the results. European companies can access nearly all U.S. research results. U.S. companies cannot access most EU research results.

Efforts to resolve these concerns through bilateral consultations and diplomatic channels have not been successful. Public discussion of financial support is clouded by European claims that continued royalty-based financing is necessary to counter the so-called “massive indirect support” Boeing receives through U.S. government military and civil R&D programs. They assert without basis that all Department of Defense, NASA, and FAA aeronautics budgets provide substantial spillover benefits to Boeing’s commercial aircraft programs. They further despair that, unlike EU launch aid, U.S. basic research funding is not repayable. This line of reasoning is self-serving and misleading. The simple fact is that companies on both sides of the Atlantic are beneficiaries of military and civil aeronautics funding.

In fact, U.S. and European parties have had difficulty even agreeing upon the problems to be discussed. The 1992 Agreement defined indirect support as government funding for aeronautical applications, including R&D, demonstration projects, and development of military aircraft, which provide an identifiable benefit to the development or production of one or more specific large civil aircraft programs.¹⁶⁸ The 1992 Agreement also contained specific requirements to exchange information annually on the direct and indirect government support to Boeing and to Airbus, as well as to provide other information in the interest of increased transparency. This requirement was intended to help the parties verify they are meeting their obligations under the agreement. Critical project appraisals (CPAs) are required under the 1992 Agreement to ensure that new civil aircraft programs supported by government launch aid will be commercially successful, and thus that sufficient sales revenues will be generated to repay government funds that were provided to help develop the new aircraft.

The United States has complied with these transparency requirements. Detailed reports of federal funding for civil aerospace research and development have been compiled and provided, even though the contract details for thousands of aeronautical R&D projects funded by NASA are publicly available. Even when NASA awarded a \$440 million “limited exclusive rights” contract to a group of U.S. companies aimed at developing technologies to support supersonic civil aircraft flight, European governments had access to contract documents that detailed the nature of the proposed project. Still, the U.S. government compiled and provided detailed reports to verify its compliance with the terms of the Agreement.

Reports of European government aeronautical funding have been far less transparent. The high-level, aggregated data on basic research provided by the EU under bilateral exchanges is so vague it is difficult to even determine which government or agency provided the funding, much less what the funding was used for. European research contract details are rarely publicly available, and in some instances are even classified.

¹⁶⁸ Annex II, paragraph 5.

Information on European “direct funding” has been even less forthcoming. The EU did not notify the United States until July 1997 of funding commitments made in 1996 by EU member states to develop the Airbus A330-200, even though the information was to be provided “at the time of government commitment.” Also contrary to the 1992 Agreement, the EU declined to provide information regarding the CPA completed for the Airbus A330-200 and the A340-500/600. The European Union claimed that the United States’s request was not “duly motivated” and therefore was declined. Most recently, the European Union declined to provide full CPA information on the A380 unless the United States agreed to new conditions, not specified in the 1992 Agreement, concerning the handling of that information, even though there was no reason to question the integrity of U.S. government data-protection practices.

The U.S. government has provided to the EU extensive background on its transparency reports and methodologies, and offered proposals to improve data exchanges, but to no avail. EU reports continued to be vague and opaque. Most recently, the United States unilaterally provided to the European Union various reports for the first time that detailed the type and funding level of U.S. Department of Defense contracts awarded to Boeing. This report was offered to increase transparency in another effort to resolve the long-running dispute over the extent to which Defense Department contracts provided a so-called spillover benefit to Boeing’s civil aircraft programs. The European Union has yet to reciprocate.

The lack of transparency itself has not necessarily directly damaged U.S. industry competitiveness. However, it certainly has increased tension between the parties and raised questions about the European Union’s commitment to the agreements.

In an effort to move beyond the longstanding dispute over launch aid to aircraft, engine, and component manufacturers, the United States has urged WTO members to maintain and deepen subsidies disciplines in future WTO negotiations. In addition, the United States has suggested that WTO members further clarify how royalty-based financing is addressed in the WTO.¹⁶⁹ These efforts, while important, are insufficient to result in near-term action to eliminate the distortions arising from launch aid. Indeed, Airbus is already requesting launch aid for its newly proposed A350 aircraft even before the A380 has been certified for commercial flight.

7.b. Government Intervention in Sales Campaigns

One of the most difficult forms of government support to address is government political intervention in international aircraft sales campaigns. Government pressure can be effective because many airlines outside the United States are substantially owned or controlled by their

¹⁶⁹ “More explicit rules are needed as to royalty based financing schemes. These programs provide government funds with a repayment obligation based on future sales. Similar to the granting of government loans or the government purchase of equity, these schemes need to be judged against a market or commercial standard. Obviously, if royalty-based financing is provided by a government to a company and repayment is based on assumptions and sales projections that would be rejected by the market, a benefit has been bestowed.” Excerpt from “Subsidies Disciplines Requiring Clarification and Improvement,” Communication from the United States to WTO Negotiating Group on Rules, March 2003.

governments. The United States supports the principle that civil aircraft purchase decisions should be based on commercial and technical considerations—and not on political factors. This principle is the foundation of provisions in the WTO ATCA and the 1992 U.S.–EU Agreement that address government-directed procurement, mandatory subcontracts, and inducements. In fact, the 1992 Agreement describes in detail the nature and form of prohibited intervention in sales competitions. Examples of prohibited inducements include:¹⁷⁰

- rights and restrictions relating to the airline industry, such as landing or route rights;
- general economic programs and policies, such as import policies, measures aiming at changes in bilateral trade imbalances, policies on alien workers or debt rescheduling;
- development assistance programs and policies, such as grant aid, loans and infrastructure financing; it is understood that the use of such assistance for the purchase of civil aircraft does not fall under this category to the extent that the granting of these funds is not conditional on such purchase taking place; and
- defense and national security policies and programs.

The United States abides by these obligations. It does not apply political pressure on its trading partners to “buy Boeing” or offer threats or economic incentives to achieve that goal. However, U.S. companies (aerospace and other industries) routinely have lost sales to foreign competitors whose governments seek to influence purchase decisions with political or economic pressure. In an effort to neutralize this type of government intervention, the Commerce Department established an Advocacy Center to coordinate U.S. government support for U.S. exporters. U.S. government advocacy is aimed at ensuring a level playing field for U.S. exporters by calling for fair and transparent procurement processes and urging foreign buyers not to be swayed by political factors. The Advocacy Center supports sales by Boeing, U.S. manufacturers of engines for large civil aircraft, and other U.S. aerospace manufacturers.

Europe has a different approach. Although perhaps not as pervasive as in the past, European government political intervention on behalf of Airbus continues, as recent cases attest.

Czech Republic: In a 2002 report on countries seeking accession to EU, the European Commission admonished the Czech Republic for eliminating a tariff differential that favored Airbus. The report implies that the accession of the Czech Republic to the EU (now completed) could have been impeded unless the Czech Republic imposed a higher tariff on imported Boeing aircraft than on imports of comparable Airbus aircraft. This publicly available report stated “The Czech Republic has unilaterally applied a suspension of MFN tariffs levied on imports of 12 civil aircraft products. Despite the Commission's strong opposition, this exceptional measure, introduced in 2000, and due to end in 2001, was prolonged until December 2002. The Czech Republic will need to ensure that this tariff suspension will not be prolonged beyond 2002.”¹⁷¹ In the same document, the Commission praised the Czech Republic for taking steps to quickly suspend tariffs on imports in other sectors.

¹⁷⁰ 1992 Agreement, Annex 1: Interpretation of Article 4 of the GATT Agreement on Trade in Civil Aircraft by Signatories of the Agreement.

¹⁷¹ *Regular Report on Czech Republic's Accession*, {COM(2002) 700 Final}, Commission of the European Communities, Brussels, October 9, 2002.

Japan: In 2003, representatives of France, Germany, and Spain protested All Nippon Airways' (ANA) decision to buy Boeing (and not Airbus) aircraft worth approximately \$2.25 billion.¹⁷² Although ANA is a private company, European Commission President Prodi complained to Prime Minister Junichiro Koizumi, reportedly saying the purchase decision was not "fair." In response, ANA said it decided to purchase Boeing because they were less expensive and could be operated at a lower cost than Airbus's aircraft. The Japanese Ministry of Foreign Affairs publicly denied that the Japanese government played any role in the decision.

Russia: According to various press reports, the French government sought to win Russian government approval of Airbus sales to Aeroflot by offering Russia the use of a space-launch facility, assisting Russia in a visa dispute with the EC concerning Kaliningrad, and easing aircraft noise restrictions for Russian aircraft landing in Europe.

Turkey: Several press articles link Turkish Airlines' (THY) purchase of Airbus aircraft, announced at the July 2004 Farnborough Air Show, with pressure on Turkey from European governments in connection with Turkey's pending accession to the European Union. According to one article, in June 2004, German Foreign Affairs Minister Fischer told a member of the Turkish Parliament to "let 80 percent of the airplanes you purchase be Airbus." THY's aircraft order announced at the Farnborough Air Show was split by value 80 percent for Airbus (and 20 percent for Boeing).¹⁷³

In recent years the U.S. government has raised concerns about this persistent political intervention on multiple occasions. Diplomatic exchanges, bilateral consultations under the 1992 U.S.-EU Agreement, and discussions through the WTO Aircraft Committee all have been unsuccessful. The United States then offered a proposal in 2003 to parties of the WTO aircraft agreement (ATCA) aimed at limiting political intervention in sales campaigns. Unfortunately, there has been little support from other committee members for this proposal.

7.c. Export Financing

The OECD Arrangement largely has been successful in removing government-supported export financing as a competitive factor in aircraft sales, at least among OECD members. The United States Export-Import Bank (Eximbank) and European ECA aircraft finance support programs are in line with the terms of the Arrangement and fee schedules are largely comparable. Regular consultations have added to the transparency of programs that diverge in some way from Arrangement terms.

A notable exception was the introduction of a new financing package by European ECAs in the late 1990s which helped Airbus to win a \$3 billion aircraft order by a group of South American

¹⁷² *Bloomberg News*, May 3, 2003; *Bloomberg News*, May 15, 2003; European Commission press briefings, May 2003

¹⁷³ *Hurriyet (Turkey) newspaper*, June 22, 2004.

airlines. Under the wrap-around loan package, airlines did not directly pay the 15 percent down payment called for under the Arrangement. Airbus extended credit to the airlines for the down payment using capital borrowed by Airbus at subsidized interest rates from French government-owned Credit Lyonnais and a German government-owned financial institution, Kreditanstalt für Wiederaufbau (KfW). Another element of the wrap-around loan was to effectively extend by three years the 12-year loan repayment period from the perspective of the purchaser, although the official support continued to technically comply with the Arrangement's 12-year term limitation. Eximbank followed suit with its own version of the wrap-around loan, which offered comparable terms for Boeing aircraft sales.

The dispute over wrap-around loans was in part a symptom of the fact that the Arrangement, negotiated in the late 1970s, does not fully reflect the realities of the 21st-century marketplace. The Arrangement calls for loans to be paid back in 12 years on aircraft that are still flying after 30 years. Commercial lenders are offering new terms and services as international finance markets have matured. Perhaps most important, one of the leading global aircraft producing countries—Brazil—is not a party to the Arrangement. Government financing for sales of Brazilian and Canadian regional jets has been hotly disputed, ending up in international arbitration at the WTO. As a result, the United States is working with its trading partners to explore the possibility of updating international disciplines on export financing, including participating in a formal OECD review of the Aircraft Sector Understanding. In a positive step, Brazil is participating in this review as a full negotiating partner.

Another major step forward in this area was the successful negotiation in 2002 of the Convention on International Interests in Mobile Equipment and a related protocol on Matters Specific to Aircraft Equipment (collectively known as the Cape Town convention). The Cape Town convention creates new rules and protocols for asset-based financing that reduce risk to lenders and increase the ability of foreign entities to purchase and lease large civil aircraft. U.S. and European authorities were leading advocates of the convention. The Eximbank has reduced its exposure fee by one third for airlines in countries that have ratified and signed the Cape Town convention with the appropriate declarations.

One area of difference between U.S. and European ECA policies relates to financial support for exports of components or engines incorporated into certain large civil aircraft assembled in other countries. In response to a request in 1972 from Airbus Industrie for Eximbank to finance U.S. content in the A-300B, the Bank sought interagency advice. The National Advisory Council (NAC) provided the following guidance:

The National Advisory Council advises the Export-Import Bank that the Bank should not, at this time, support the financing of the export of the U.S. content on the A-300B Airbus or Dassault Mercure. This advice applies to all methods of financing including financing to buyers of the aircraft or to an intermediary European obligor over a term customary for a complete aircraft, or to the European aircraft manufacturing company over a term customary for the equipment.

The NAC adopted this position in recognition of the strategic importance of a viable U.S. aerospace sector, which was being threatened by a new European competitor that benefited from

substantial European government subsidies, as described in Section 7.a. This so-called “Airbus policy” continues to be implemented today, and Eximbank will not finance any U.S. content on any Airbus aircraft. At least some of the Airbus ECAs do not have a comparable policy with respect to its country's content on Boeing aircraft. For example, the U.K. Export Credits Guarantee Department (ECGD) does provide financial support for U.K.-manufactured Rolls-Royce engines on Boeing aircraft.

7.d. Bribery

Government policies related to the practice of bribery of foreign public officials have affected aircraft sales as well in some countries. The U.S. Foreign Corrupt Practices Act (FCPA) of 1977 has disciplined the conduct of U.S. firms for over a quarter century. The FCPA prohibits payments by U.S. companies and individuals, including exporters of aircraft, to foreign public officials in order to obtain or retain business.

Up until 1999, European laws on transnational bribery were nonexistent. In fact, some European governments tacitly endorsed the practice of bribery by treating bribes to foreign public officials as a legitimate business expense. Accordingly, some European aerospace manufacturers were widely alleged to have engaged in bribery of foreign public officials to win sales at the expense of their U.S. competitors.¹⁷⁴

The FCPA has had a major impact on how U.S. firms conduct international business. However, in the absence of similar legal prohibitions by key trading partners, U.S. businesses were put at a significant disadvantage in international commerce. In response, the U.S. government led efforts to negotiate in the Organization for Economic Cooperation and Development (OECD) the Convention on Combating Bribery of Foreign Public Officials in International Business Transactions (antibribery convention). The antibribery convention was adopted in November 1997 and entered into force on February 15, 1999, for 12 of its then 34 parties. All 30 OECD members and six non-members (Argentina, Brazil, Bulgaria, Chile, Estonia, and Slovenia) are now parties to the antibribery convention. The antibribery convention requires parties to criminalize under their national laws the offering, promising, or payment of bribes to foreign public officials to obtain or retain business; it seeks to eliminate the supply of bribes. The United States implements its obligations under the antibribery convention through the FCPA.

Despite the important positive steps taken by other parties to the OECD antibribery convention, the U.S. government remains concerned that enforcement of the foreign bribery offense has been inconsistent. Whereas the U.S. government rigorously enforces the FCPA, some leading parties to the antibribery convention are working through enforcement issues.¹⁷⁵ The U.S. government

¹⁷⁴ “Special Report: Airbus's secret past - Aircraft and bribery,” *The Economist*, June 14, 2003.

¹⁷⁵ 2005 Criminal and Civil Enforcement Actions through February 2005: *United States v. Monsanto Co.* (D.D.C., 2005) & *SEC v. Monsanto*—the Defendant agreed to pay a \$1,000,000 criminal penalty and admit to violation of FCPA and consented to pay a \$500,000 civil penalty and to Commission’s issuance of its administrative order; *InVision Technologies, Inc. & SEC v. GE InVision Inc.*—the Defendant admitted to violations of the FCPA with regard to several countries and agreed to pay \$800,000 in criminal penalties, and agreed to disgorge \$589,000 in profits plus prejudgment interest of approximately \$28,700, and pay a \$500,000 civil penalty; *United States v. Titan*

expects all parties, including its competitors in the aerospace sectors, to comply fully with the obligations of the antibribery convention by ensuring that each has effective laws in place to combat bribery and to enforce those laws by investigating and prosecuting all credible allegations of bribery of foreign public officials.

All 36 parties to the antibribery convention agreed to implement the 1996 recommendation of the OECD council on the tax deductibility of bribes to foreign public officials (1996 OECD recommendation). The U.S. government remains concerned that some tax systems may continue to not expressly prohibit tax deductibility of bribes to foreign public officials.¹⁷⁶ The OECD Working Group on Bribery (WGB) is monitoring the actions of antibribery convention participants to determine the effectiveness of mechanisms to identify and disallow tax deductions for bribes to foreign public officials. The U.S. government will continue to play an active role in that effort and in the efforts of the OECD Committee on Fiscal Affairs to strengthen the 1996 OECD recommendation.

OECD members also are seeking to deter and combat bribery in transactions that benefit from official export credit support. The OECD Working Party on Export Credits and Credit Guarantees (ECG) adopted an Action Statement on Bribery in December 2000, which calls for participants to take appropriate measures to deter bribery before official export credit support is granted.¹⁷⁷ Among other things, this may include informing applicants who request credit support about the legal consequences of bribery in international business transactions, having an applicant provide an antibribery undertaking or declaration, and refusing to approve support if there is sufficient evidence that bribery was involved in the award of an export contract. Participant progress in implementing these provisions is reported in a survey of antibribery measures made available to the public by the OECD.¹⁷⁸ The USG is committed to further strengthening antibribery measures related to export credits.

The U.S. government is combating bribery and corruption on a number of international fronts. For example, we are seeking and obtaining binding commitments in free-trade agreements that promote transparency and that specifically address corruption of and by public officials.

Corporation & SEC v. The Titan Corporation—the Defendant agreed to pay a criminal fine of \$13 million, accepted three years probation and was required to institute strict compliance and internal control program; in a civil action, the defendant was (i) enjoined from future violations of FCPA and required to pay \$15.479 million in disgorgement and prejudgment interest and (ii) pay a \$13 million civil penalty.

¹⁷⁶ *Addressing the Challenges of International Bribery and Fair Competition 2004*, U.S. Department of Commerce, International Trade Administration, July 2004. www.tcc.mac.doc.gov/pdf/2004bribery.pdf

¹⁷⁷ www.oecd.org/ech/docs/bribery-en.pdf

¹⁷⁸ The 2004 survey is available at [www.oilis.oecd.org/oilis/2004doc.nsf/LinkTo/td-ecg\(2004\)9](http://www.oilis.oecd.org/oilis/2004doc.nsf/LinkTo/td-ecg(2004)9).

Chapter 8 – Aircraft Certification and Regulations

8.a. Safety

U.S. and European aviation authorities grant safety and airworthiness certification to commercial aircraft and operators. Certification has on limited occasions been used by European authorities to achieve competitiveness instead of safety objectives. Typically, certification decisions have been made according to objective safety-related determinations. There is significant international coordination and collaboration among civil aviation authorities on safety certification issues. However, the United States appears to be lagging behind Europe in promoting standards and procedures in other countries, with possible implications for global competitiveness of U.S. manufacturers.

U.S. and European safety regulations and standards are largely based on global aviation standards and recommended practices (SARPs) developed through the International Civil Aviation Organization (ICAO). SARPs have been adopted covering all aspects of civil aviation (such as aircraft, airspace, airports, and operations and security). As parties to the Convention on International Civil Aviation (also known as the Chicago Convention), ICAO contracting states are required to incorporate these standards into their national regulations unless they file a “difference” with ICAO. Recommended practices are not required to be adopted, but are highly encouraged. Aerospace manufacturers and airlines provide input during development of SARPs.

National Authority

In the United States, the national aviation regulatory authority is the U.S. Federal Aviation Administration (FAA). The FAA develops and implements safety regulations for certification of aircraft, aircraft operations, and licensing of aviation personnel. The FAA also ensures compliance and enforcement of those regulations and standards. FAA requirements are formally published as Federal Aviation Regulations (FARs) in Title 14 of the Code of Federal Regulations. Aerospace companies and other authorities participate in development of FARs through formal government rulemaking procedures.

All aircraft registered in the United States or used by a U.S. operator, regardless of country of manufacture, are required to comply with U.S. airworthiness standards. The FAA is required by law to make certain findings or determinations of compliance to U.S. airworthiness standards before issuing any approvals or certifications.¹⁷⁹ The FAA certifies both that an aircraft’s design meets relevant U.S. airworthiness standards (type certificate), and that a specific product conforms to the approved design and is in a condition for safe operation (airworthiness certificate). The FAA further certifies facilities for the repair of products and approves airline operations, including their fleet.

In Europe, the responsibility for safety-related certification is shared between EU member states and the European Aviation Safety Agency (EASA), established in 2003 to develop common aviation safety rules applicable throughout the EU. Initially, EASA developed rules (which are formally adopted by the European Commission) in the fields of aircraft certification and

¹⁷⁹ 49 U.S.C. 44704.

maintenance. A proposal to expand EASA's authority to aircraft operations and flight crew licensing is currently out for comment. Final rules in these areas are not expected to be issued for at least two years.

In addition to its rulemaking capacity, EASA has direct responsibilities in certification activities related to aircraft design, and in the certification of aeronautical repair stations outside the EU. Within the EU, EASA oversees Member States' compliance with EASA rules that are not carried out directly by EASA (such as the approval of maintenance organizations within Member states' territory). Finally, EASA assists the European Commission in aviation safety interactions with other countries.

Prior to establishment of EASA, certification and safety policies had been agreed upon among the European Joint Aviation Authorities (JAA), representing the civil aviation authorities of 38 European countries (including all 25 EU members), and then implemented by the JAA member state national aviation authorities. The JAA developed Joint Aviation Requirements (JARs) similar to the U.S. FARs. However, unlike the FAA, the JAA did not have the authority to enforce adherence to JARs among its member authorities. Manufacturers of aircraft and equipment still had to apply for certification and licenses individually from each European state. Inconsistency, delay, and lack of transparency in the certification process were problems repeatedly cited by U.S. industry under the old system. U.S. manufacturers were particularly frustrated by the JAA certification process, which often had been time consuming, costly, and not always respected by all member authorities.

Consolidating this authority in a single, new European institution involves significant policy and implementation challenges within Europe. Although legally established in 2003, EASA has been slow to build its own infrastructure and hire its own employees. In the meantime, employees of national European authorities are continuing to conduct the certification work on behalf of EASA. In the near term, this situation just adds one more obstacle to an already complicated process. In the long term, this could be a concern if member state experts do not transition to the new European authority, resulting in a smaller base of experience of EASA employees.

EASA eventually will enter into agreements with non-EU countries, such as Iceland, Norway, and Switzerland, and then these countries will abide by EASA regulations and fall under EASA oversight. In addition, EASA has joined the JAA, allowing EASA regulations to replace existing JARs in those areas under EASA's authority. While non-EU JAA members still will need to incorporate these regulations into their national systems, a single European standard will be maintained.

International Collaboration

ICAO standards provide the basis for the safe operation of foreign airlines in U.S. airspace, and vice versa. The FAA ensures that foreign operators flying into the United States are adequately overseen by a competent aviation authority in accordance with ICAO standards through bilateral agreements. Bilateral airworthiness agreements (BAA) and bilateral aviation safety agreements (BASA) provide for technical cooperation between the U.S. FAA and its counterpart authorities

in other countries on aviation safety issues. BAAs and BASAs enable the FAA to rely at least in part on a foreign aviation authority's recommendation that aircraft and components, repair stations, flight crews, and flight simulators satisfy U.S. requirements. BASAs consist of an executive agreement as the overarching document and one or more implementation procedures. For example:

- Implementation procedures for airworthiness (IPAs) define the civil aeronautical products, parts, and appliances eligible for import into the United States and the BASA partner country, and define the requirements for interaction between the U.S. and foreign authorities for the import and continued support of those civil aeronautical products.
- Maintenance implementation procedures (MIPs) provide that the FAA and a BASA partner authority may reciprocally accept recommendations for certification and continued surveillance of aeronautical repair stations within their own borders.

These bilateral agreements do not relieve the FAA of its statutory responsibilities for certification. However, they provide an alternative means for the FAA to make its findings, recognizing the competency of another authority to conduct certification functions in a manner comparable to, and on behalf of, the FAA. Bilateral agreements also commit foreign authorities to fully cooperate with and assist the FAA in the timely resolution of safety issues that may arise once aircraft imported under a bilateral agreement enter into service on the U.S. aircraft registry. In this way these agreements reduce the cost and time required for the certification in multiple countries and facilitate trade without compromising safety.

Even though U.S. and European safety certification regulations are based on ICAO SARPs, some differences remain. To improve and simplify the certification processes in the United States and Europe, the JAA and FAA had agreed to harmonize to the extent possible:

- 1) requirements regarding design, manufacture, operation, and maintenance of civil aircraft and related products and parts,
- 2) aircraft and aircraft engine noise and emissions, and
- 3) flight crew licensing.

Most of the differences between the FAA and the JAA related to certification have been resolved over the last 20 years through extensive harmonization efforts. This close coordination is reflected in the fact that the FAA has BAAs or BASAs with 12 of the previous 15 EU member states.

The most pressing issue now is how to transition existing safety and certification agreements between the United States and the EU member states to a single bilateral agreement with the European Community without disruption in the trade and operation of aviation goods and services. The FAA has begun formal negotiations with the EC to establish the legal framework for FAA-EASA relations. Regulatory cooperation is a key element in the negotiations. EASA supports FAA participation, on a case-by-case basis, in regulatory preparatory work such as the

drafting of rules, either through joint efforts or by assigning the drafting of specific rules either to the FAA or EASA and then sharing drafts for adoption by both authorities using their normal procedures. The FAA will strive to continue to minimize differences between U.S. and European aviation safety requirements, policy, and procedures.

Competitiveness Impact

Safety certification should be objective and not designed to provide one company or industry a competitive advantage over another. Usually, this has been the case. However, European aviation authorities have in the past appeared to use safety certification to provide competitive advantages to European manufacturers. European authorities have in the past suggested that some FAA certification decisions were made to achieve competitive advantages for U.S. manufactured products.

For example, U.S. and European companies have raised concerns in the past about certain extended-range, twin-engine operations (ETOPS) certification decisions by U.S. and European authorities that appeared to have been based on trade or competitive as opposed to safety considerations. ETOPS rules dictate the maximum distance away from a designated emergency airport a two-engine aircraft is permitted to be during routine flight, as measured in minutes it would take to fly to an emergency airport in the event of trouble. FAA and JAA ETOPS rules are aircraft- and airline-specific, based on the model of aircraft and engine being used and the operating history and maintenance procedures at an airline.

The certification of ETOPS operation became a potential trade issue when U.S. business jets, all twin-engine, were compared with the tri-engine Dassault Falcon fleet from France; or the twin-engine Boeing 777 was compared with the four-engine Airbus A340. The EU incorrectly claimed that the FAA granted ETOPS to 777 aircraft to give it a competitive advantage over the four-engine A340. At the same time, the JAA proposed granting only limited ETOPS operation for U.S. aircraft. These potential trade disputes were averted through close consultation between U.S. and European aviation authorities.

In another instance, Boeing faced repeated delays by the JAA in defining certification requirements for the so-called “new generation” derivatives of the Boeing 737 aircraft due to alleged concerns regarding additional seats and exit doors. The JAA finally validated FAA certification in 1998, but French aviation authorities refused to accept the JAA determination. For six years, 737s built with the enhanced exit doors had to block off four passenger seats to comply with French certification. The full seating configuration is now accepted under EASA, regulations which have overridden French national certification.

Certification differences have affected sales of smaller aircraft as well. For example, the JAA refused to validate FAA’s certification of the Gulfstream G-V business jet until Gulfstream conducted expensive tests of the aircraft wings to meet European authority requirements for wing-structure integrity. The design subsequently failed the European-required wing test and needed to be modified to meet the stricter European requirements. In this case, what was perceived by U.S. industry to be a purely competitive measure was based on a valid safety

concern. The JAA's finding did not invalidate the FAA's certification of the aircraft, but did result in a further enhancement of the safety of the aircraft.

In spite of these examples, there is no evidence of widespread manipulation of safety or airworthiness certification processes to achieve competitive goals, nor is there a suggestion that the FAA should withhold certification for any reason other than objective safety concerns. In fact, U.S. and European certification processes must be transparent and objective enough to be above suspicion. Establishment of EASA is anticipated to lead to further transparency and consistency of certification decisions in the future.

Potential for United States Leadership

Developing countries often seek guidance from U.S. and European government aviation experts when developing their own national regulations. Industry representatives frequently supplement (or sometimes replace) this assistance through training centers and technical exchanges. This training by U.S. or EU government or industry experts enhances the familiarity of those being trained with the procedures, requirements and/or products of a particular country.

For example, the FAA worked with ICAO to develop model regulations that could be easily implemented at little or no cost by developing countries. In addition, the FAA helped establish the ICAO TRAINAIR program, through which the FAA assists foreign aviation authorities in the development of safety oversight systems. The FAA is involved in a broad array of direct technical assistance programs as well. While the primary purpose of such activities is to enhance the safety and operation of the global air transportation system, the added familiarity can have an additional benefit of providing a competitive advantage for aerospace suppliers from the country providing the training.

European governments and industry associations (often in collaboration) are participating in an increasing number of aviation-related training centers and technical exchanges with other countries in an effort to promote European regulations and procedures. Conversely, budget and legal constraints have curtailed to some extent U.S. federal agency training of foreign aviation authorities in the United States and abroad. U.S. industry has not been in a position to provide significant resources to fill the gap.

The FAA has worked extensively with other federal and multilateral agencies to leverage resources to enable the provision of FAA technical assistance to foreign aviation authorities. While this assistance has proved successful in raising safety levels while expanding the global aviation market, additional financial resources targeted toward aviation technical assistance would be necessary in order to provide more assistance globally. Moreover, technical assistance programs draw on existing FAA human resources that are primarily engaged in the core mission of ensuring the safety of the domestic aviation system. Expanding the availability of FAA technical expertise for foreign assistance programs may require a reassessment of personnel levels in key areas to accommodate the increased demand.

ICAO is playing a greater role in enhancing safety of the global aviation system through the ICAO Universal Safety Oversight Audit Program (USOAP). Assessments under this program

identify whether ICAO contracting states have implemented an adequate aviation safety oversight system, in line with ICAO requirements. ICAO also is developing a unified strategy to assist states in correcting their safety oversight deficiencies. The FAA assisted in the development of USOAP and continues to support improvement of the program.

8.b. Environment

The environmental impact of aviation is one of the key constraints on future growth of aircraft operations. There is increasing attention being given to aviation's environmental impact worldwide. Longstanding issues concerning local air quality and aviation noise on communities around airports are being joined by an additional focus on aviation's potential impact on global climate change. Governments establish domestic standards and regulations related to aircraft noise and emissions, typically based on global standards and recommended practices. However, environmental regulations have in the past been used to achieve competition-related as well as environmental objectives. Attention to aviation environmental issues has grown in Europe in particular where “green” political parties often hold balancing roles in multiparty governments.

Similar to the SARPs for safety certification discussed in Section 8.a., ICAO members develop standards and recommended practices for aviation environmental protection as well. These SARPs are developed by the ICAO Committee on Aviation Environmental Protection (CAEP), comprising government technical aviation experts from 23 countries, including the United States and nine European countries, and experts from a number of observer organizations representing aerospace manufacturers, airlines, labor unions, airports, and environmental nongovernmental organizations. U.S. industry representatives actively participate in CAEP working groups and provide technical expertise to CAEP members.

Standards, recommended practices, and guidelines for noise-related certification of aircraft engaged in international air navigation are contained in Annex 16, Volume 1, to the Convention on International Civil Aviation. The most recent standard for aircraft noise was adopted by ICAO in June 2001.¹⁸⁰ ICAO also has established recommended practices for mitigating the impact of aircraft noise. In January 2001, CAEP members approved an approach to noise mitigation that includes the reduction of noise at its source (e.g. new standards for the aircraft), improved land use planning around airports, and a wider use of aircraft operating procedures and restrictions that abate noise. The “balanced approach” consists of evaluating the range of options available to most cost effectively mitigate local aircraft noise instead of simply imposing a ban on operations of certain aircraft, as had been past practice among some ICAO members.

SARPs for emissions-related certification of aircraft are contained in Annex 16, Volume 2, to the Convention on International Civil Aviation. These SARPs relate to the primary exhaust emissions from jet aircraft engines during the landing and takeoff cycles, including oxides of nitrogen (NO_x), hydrocarbons (HC), carbon monoxide (CO), and smoke.

¹⁸⁰ This standard is ten decibels lower, on a cumulative margin basis, than the previous standard (contained in Chapter 3 in ICAO Annex 16). The new noise standard will apply to any application for new aircraft-type designs submitted on or after January 1, 2006, for countries that use Annex 16 as its noise certification basis.

The Chicago convention also contains provisions on acceptance of other ICAO member environmental certification. According to the convention, contracting states shall recognize as valid a noise or emissions certification granted by another contracting state provided that the certification was granted under conditions at least equal to the applicable international standard. ICAO requires contracting states to notify the organization of any differences between their national requirements and practices and the international standards.

Noise

In the United States, the FAA seeks to reduce the impact of aircraft noise in two ways—through “standards to measure aircraft noise and sonic boom; . . . and regulations to control and abate aircraft noise and sonic boom.”¹⁸¹ The FAA’s noise standards and regulations apply to the issuance of aircraft-type certificates and standard airworthiness certificates for all types of aircraft.¹⁸² Applicants must demonstrate compliance with the noise standards through a prescribed noise-measurement test. In Europe, aircraft noise certification is the responsibility of EASA. Noise certification certificates are issued by the national civil aviation authority of the EU member state where the aircraft is registered.

In August 2002, the FAA amended the noise-certification standards for subsonic jet airplanes and subsonic transport category large airplanes. These changes resulted from the joint effort of the FAA, the European JAA, and the Aviation Rulemaking Advisory Committee (ARAC) to harmonize the U.S. noise-certification regulations and the counterpart European joint aviation requirements (JARs). This harmonization effort was based on ICAO SARPs and guidelines contained in ICAO Annex 16, Volume 1, Aircraft Noise, and its associated environmental technical manual. The changes to the FAA requirements provide nearly uniform noise-certification standards for airplanes certificated in the United States and in the JAA countries. The harmonization of the noise-certification standards simplifies airworthiness approvals for import and export purposes.

The FAA proposed a new noise standard in December 2003 for subsonic jet airplanes and subsonic transport category large airplanes based on the newest ICAO noise standard. This noise standard would ensure that the latest available noise-reduction technology is incorporated into new aircraft designs. The FAA’s proposed Stage 4 noise standard would have to be met by all applications for new airplane-type designs submitted to the FAA on or after January 1, 2006. The standard may be chosen voluntarily prior to that date. European authorities are in the process of taking similar action to implement the new ICAO noise standard.

Noise-related restrictions on aircraft operations are established at a federal level in the United States. Such restrictions have largely been based on international guidance established through ICAO. For example, under the U.S. Airport Noise and Capacity Act of 1990 (ANCA)¹⁸³, airplanes over 75,000 pounds must meet a specific noise level to be permitted to operate to or

¹⁸¹ 49 U.S.C. 44715.

¹⁸² 14 C.F.R., Part 36

¹⁸³ 49 U.S.C. Chapter 475-Noise

from an airport in the United States.¹⁸⁴ However, airports may not impose additional restrictions on aircraft that meet current FAA regulations, except under limited circumstances. Local airports are allowed to establish some aircraft noise-related rules for local operations only following a thorough review, including public comment, of the proposed restrictions to evaluate their noise benefits, their costs, and alternatives that might produce the desired noise relief. By law, any restrictions require either a formal voluntary agreement among all airport users, or they must meet the following criteria as found by the FAA: they must be reasonable, nonarbitrary, and nondiscriminatory; they must not create an undue burden on interstate or foreign commerce; they must maintain safe and efficient use of the navigable airspace; there must be an adequate opportunity for public comment; and they must not create an undue burden on the national aviation system. The availability of certain federal funds for airport improvements is tied to compliance with provisions of this law.

Aircraft noise-related operating restrictions and related policies are somewhat more fragmented among European countries than in the United States. Common rules and procedures relating to noise-related operation restrictions at European Community airports are contained in European Directive 2002/30/EC,¹⁸⁵ which entered into force on March 28, 2002. This Directive largely incorporates elements of the ICAO balanced approach, establishing some guidelines for evaluation of alternative measures and limitations on certain types of operating restrictions. However, it was up to EU member states to adopt national legislation implementing the measures included in the directive (to be completed as of September 2003.) In addition, requirements for public consultation and assessment of alternate measures are more lax than those by the FAA. Airport-related policies are further coordinated among the forty one members of the European Civil Aviation Conference (ECAC) who seek to promote uniformity in the adoption and integration of environmental recommendations and measures among European airports.¹⁸⁶ There is no central airport oversight or enforcement authority at the pan-European level, and no direct link to EU funding of airport projects as exists in the United States.

Emissions

U.S.-certified aircraft are required to comply with strict engine exhaust emissions standards. Under the Clean Air Act (CAA) of 1970, the Environmental Protection Agency (EPA) has adopted the emissions standards set forth by ICAO. Under the authority of the CAA, the FAA then implements regulations¹⁸⁷ that enforce the standards promulgated by EPA.¹⁸⁸ These regulations apply to all civil airplanes that are powered by aircraft gas turbine engines, including turboprop, turbofan, and turbojet engines. The FAA ensures compliance with these emissions regulations by reviewing and approving certification test plans, procedures, test reports, and the engine emissions certification levels.

¹⁸⁴ With the exception of state aircraft operated by foreign governments as recognized under FAA rules.

¹⁸⁵ Directive 2002/30/EC of the European Parliament and of the Council of 26 March, 2002, *Official Journal of the European Communities* L85, March 28, 2002, pp. 40-46.

¹⁸⁶ ECAC Environmental Policy Statement, DGCA/95, Haren, January 10-11, 1996.

¹⁸⁷ 14 C.F.R. Part 34

¹⁸⁸ 40 C.F.R. Part 87

National civil aviation authorities in Europe are responsible for emissions standards and regulations. The European Commission has adopted a number of directives governing aircraft emissions within the European Union which are to be incorporated into EU member state national law.

U.S. government agencies work with U.S. industry representatives to develop new technologies for the reduction of aircraft noise and greenhouse gas emissions. For example, the FAA participates in and supports environmentally focused research and development programs at the National Aeronautics and Space Administration (NASA). These programs are aimed at developing high-payoff propulsion technologies that enable safe, economical, and environmentally acceptable aircraft to provide a highly productive air transport system. Regarding aircraft engine emissions, these programs are assessing the impact of aviation on air quality and the upper atmosphere, identifying fuel efficiency improvements, and identifying engine emissions reduction technologies for development and incorporation into future airplane and engine designs.

European governments also are investing domestic research and development funding in projects intended to mitigate the environmental impact of civil aircraft. Some of this funding takes place at the local or national level. However, the environment is an increasing focus of European Commission funding for aeronautical research.

In the meantime, engine manufacturers continue to improve their products, resulting in improved fuel efficiency and reduced emissions levels. This is evidenced by the reduction in the engine emissions certification levels experienced over the past few years. With continued funding of public and private research activities, this trend is anticipated to continue into the future.

Competitiveness Impact

Internationally recognized standards and recommended practices and bilateral cooperative efforts have largely led to common environmental regulations around the world. Countries that deviate from these standards or procedures can significantly impair the competitiveness of U.S. industry. European aviation authorities have in the past used environmental certification to provide direct and indirect competitive advantages to European manufacturers and operators.

As one example, on April 29, 1999, the European Union (EU) adopted a regulation limiting the registration and use within the EU of certain aircraft modified to meet the most stringent ICAO noise-certification standards, including aircraft equipped with “hushkits” and those re-engined with engines of a certain design.¹⁸⁹ The regulation was in effect a trade barrier disguised as environmental protection and cost U.S. industry an estimated \$2 billion.

Failing to have the hushkit regulation withdrawn through diplomatic approaches, the United States initiated a formal dispute resolution proceeding against 15 EU member states before the ICAO Council under Article 84 of the Chicago convention. The debate over airport noise

¹⁸⁹ A “hushkit” is an FAA-certified mechanical modification to an aircraft engine to reduce the level of aircraft noise emitted by the engine.

continued into the ICAO General Assembly in the fall of 2001. After intense negotiations, principally between the U.S. and European delegates, the assembly unanimously adopted the “balanced approach” described above.

Agreement on the new noise standard and the balanced approach facilitated adoption of the new EU noise directive, which included repeal of the hushkit regulation. However, immediately following repeal of the EU hushkit regulation, Belgium adopted a decree restricting night flights of hushkitted and certain re-engined aircraft effective in July 2003. Accordingly, the U.S. government maintained the ICAO Article 84 complaint about the hushkit regulation against Belgium. The hushkit dispute was formally ended in December 2003 following the adoption of a new Belgian decree to implement the EU noise directive.

Although ICAO SARPs and the EU noise directive enabled the resolution of the transatlantic hushkit dispute, noise-related policies at European airports continue to be of significant concern. Multiple European countries have considered or imposed other noise-related restrictions that appear inconsistent with the letter and the spirit of the balanced approach and the EU noise directive, and that could have a negative impact on aviation interests.¹⁹⁰ Many of these restrictions relate to night flights. For example, local Belgian officials continue to spar over noise-related nighttime operating restrictions for aircraft using Brussels-area airports even after adopting the EU noise directive. Concerns about these restrictions reportedly led to an announcement in October 2004 by air cargo operator DHL of plans to move its European headquarters and distribution hub from Brussels to a different European airport.¹⁹¹

As another example, France has considered an array of politically motivated noise-mitigation measures at Charles de Gaulle (CDG) and other airports, including multiple measures affecting night operations. French Minister of Transportation Gilles de Robien issued a “temporary” order on October 17, 2002, effectively limiting the number of nighttime landing and takeoff slots available at CDG (mostly affecting U.S. express cargo airlines) while increasing the number of daytime slots (mostly to the benefit of Air France). French officials also considered a decibel cap on allowable noise levels for aircraft on approach to CDG as well as increasing noise-related taxes on airlines. Restrictions on night operations at CDG approved in November 2003 were largely unchanged from the temporary orders. Regulations restricting some or all night operations also have been adopted for French airports in Lyon-Satolas, Muhlhouse/Basel, Nice, and Toulouse.

Concern about such policies in various EU member states has led the U.S. government to carefully monitor compliance with European and international rules on noise mitigation. Most EU members have stated that they do not intend to diverge from the EU directive, although many face domestic political pressure to reduce the environmental impact of aviation. The European Commission is closely monitoring member state actions as well, and filed infringement proceedings against at least two EU member states’ noise measures. However, unilateral policies and after-the-fact negotiations with individual companies in multiple European countries

¹⁹⁰ *European Express Association Noise Update*, April 2004.

¹⁹¹ “DHL to Pull Hub From Brussels Amid Row Over Night Flights,” *Wall Street Journal Online*, October 21, 2004.

have set a poor precedent for future actions across Europe.

The competitive impact of emissions-related policies also must be carefully monitored, especially since there is less agreement at the international level on appropriate practices than is the case for aircraft noise. Some European countries currently impose emissions-related fees on aircraft landing at their airports. ECAC is developing regional, harmonized guidance for local aviation emissions charges, based on fee systems already in place in Switzerland and Sweden. The German environmental agency proposed ending airline tax privileges and imposing aircraft landing charges based on emissions levels. The United Kingdom considered landing charges based on an aircraft's emissions of oxides of nitrogen (NOx) as early as 2003. Many European governments appear unwilling to wait for international agreement before putting domestic measures in place.

In addition, the European Commission and Parliament are considering additional EU guidance or requirements related to emissions-based operating restrictions and fees at European airports. The EC reportedly is preparing to recommend a European-wide charging system related to emissions. Additional fees have been proposed in the form of a tax on aviation fuel as well. In February of 2003, the European Parliament adopted a nonbinding resolution on the commission's white paper European Transport Policy for 2010. With regard to aviation policy, members of Parliament called upon the commission to "work vigorously with the International Civil Aviation Organization (ICAO) for the introduction of a worldwide aviation fuel tax." The Commission unsuccessfully pressed for ICAO endorsement of such a tax at the 2004 ICAO Assembly. The U.S. government has urged the European Union to delay instituting unilateral emissions regulations prior to ICAO consensus on objective policy guidelines.

Divergence or Convergence in the Future?

Development of future environmental standards and policies will continue to be contentious. One debate is focused on the role of standards themselves. Traditionally CAEP has adopted technology-progressing standards for aircraft emissions, setting new standards within the capabilities of proven technology and certified products. This principle encourages manufacturers to incorporate known and feasible technology improvements into engines to meet new standards while still encouraging innovation in development of new technology. The high premium placed on safety of aircraft operations discourages the establishment of standards that mandate the use of unproven technology in new engines under development. However, some seek to change to a technology-forcing approach that would set standards beyond what is technologically feasible in hopes that a technological solution can be identified, built, and certified prior to the standards implementation date.

Another debate relates to types of standards under development. In addition to emissions during the landing and takeoff cycle, there is growing concern over the potential for aircraft engine emissions to influence global climate. Aircraft engine greenhouse gas emissions of carbon dioxide and NOx during cruise operations are not currently regulated, and the scientific uncertainty of their impact on the environment is still unclear and evolving. ICAO, in conjunction with other United Nations bodies, is closely monitoring the ongoing research aimed

at addressing the scientific uncertainties associated with emissions from aircraft engines during the cruise phase of flight.

A third area of debate relates to expanding the types of emissions that are covered by ICAO standards. Regulatory and health agencies in the United States and other countries have found that exposure to particulates may be hazardous to human health and the environment. Particulate emissions are also a concern because of their potential contribution to global climate change. Aviation is a known source of particulate emissions. However, there is little information on the characteristics of these emissions (e.g., emission rate, particle-size distribution, density, toxicity, and behavior in the environment) to quantify and assess their potential impact. Research is ongoing to better understand the formation of particles, their composition, and growth and transport mechanisms to assess aviation's contribution to total ambient particulate concentrations. Such data is also critical to assess potential interrelationships between particulate emissions and other aviation emissions, as well as noise, and to determine if mitigation strategies are needed to deal with particulate emissions related to aviation. Once this information is available it is expected that ICAO will consider the extent to which particulate emissions should be regulated within the certification process.

Chapter 9 – Aircraft Operations

9.a. International Air Services

In negotiating aviation agreements, the primary focus of the U.S. government is to expand opportunities for air services by eliminating barriers to entry, restrictions on air carrier operations, and restrictions on airfares. “Open skies” air transport agreements, and the resulting competition, new services, and lower airfares that result from them, promote air travel and commerce and increase opportunities for all affected air carriers, U.S. and foreign. In air transport agreement negotiations with other countries, the U.S. government does not intentionally promote the commercial interests of U.S. aircraft or engine or aerospace supplier firms or industries. More air service means more commercial opportunities for all aerospace and aircraft-manufacturing firms, regardless of their country of origin.

Bilateral and Multilateral Frameworks

International air services operate under a legal and regulatory framework that is embodied in air transport agreements. The United States has more than 100 bilateral agreements with partners worldwide and a multilateral agreement with six countries. Bilateral agreements establish which passenger and cargo airlines may provide services between the two countries, what types of services they may provide, which airports they may use (and when), and even in some cases the prices they may charge. Although the degree of liberalization of air services varies widely among various bilateral agreements, few agreements permit airlines to take on new passengers or cargo in a foreign country and transport them to another destination in the same country, a type of service known as cabotage that is usually precluded by domestic law.

The bilateral framework was established more than 60 years ago as many nations sought to rebuild a civil aviation industry that had been devastated by the effects of World War II. In general, a major premise for establishing the postwar bilateral aviation system was that every nation had a right to its own national airline and that governments had to tightly regulate civil aviation not only to ensure the safe operations of their airlines but also to see that the airlines survived.

This system that was intended to nurture growth instead began to stifle it as many governments used their bilateral aviation relations to limit market access and protect their national carriers. The ability of countries to negotiate new bilateral rights could rarely keep up with the demand promoted by postwar economic and technological development.

In 1992, the United States took the lead in developing a network of fully liberalized–“open skies”–aviation agreements. These agreements seek to get governments out of the business of regulating the economics of international air transportation. They grant an unlimited number of carriers from each country in the agreement the right to fly as many flights as they want, to as many points in the other country as they want, carrying traffic from or to as many third countries as they want, and charging whatever prices they want. Thus, carriers can enter new markets at will and increase frequencies as market conditions dictate. By early 2005, the United States had

nearly seventy “open skies” agreements with nations in every region of the world. In addition, a number of other countries concluded “open skies” agreements among themselves.

These agreements have produced significant public benefits. Airlines operating under liberalized aviation agreements have been able to grow and to expand into new markets. Liberalized transportation agreements have created new travel options in thousands of international aviation markets. They have promoted trade and commerce around the world by creating new markets for cargo and businesses such as fresh flowers, fruits, vegetables, and fish. “Open skies” agreements have helped travel and tourism to become one of the world’s largest industries.¹⁹²

Finally, “open skies” agreements have improved service and lowered fares for passengers and shippers. A Department of Transportation study of the transatlantic passenger market found that the average fare between 1996 and 1999 decreased twice as much in “open skies” transatlantic markets (20 percent) as it did in non-“open skies” transatlantic markets (10 percent), while overall traffic growth in the transatlantic markets increased 30 percent.¹⁹³

Passenger carriers are seeking to extend their global reach through global alliances and through code sharing. Global business alliances help U.S. and international air carriers to overcome national ownership rules and restrictions on travel routes. These arrangements between air carriers often include route access and marketing provisions such as code sharing and joint frequent-flier miles programs. Code sharing is a marketing arrangement in which an airline markets and sells air transportation service in its own name, even though part of or the entire journey is flown on the aircraft of another airline. Code sharing allows an airline to expand services in new markets before committing its own aircraft or to offer service to destinations that it cannot serve viably on its own, and benefits the operating carrier by increasing its passenger loads. Airlines also have extended to more intense cooperation and business integration in the form of shared facilities and aircraft as well as maintenance agreements.

Carrier alliances have increased service and scheduling options for both small and large markets. The U.S. Department of Transportation has examined global aviation alliances and found a marked increase in service to and from smaller markets and decreased fares on routes that include alliance gateways.¹⁹⁴ The report found that the number of markets and city-pairs served by alliances has increased greatly, offering more choices and travel flexibility for customers. For example, the Northwest/KLM alliance served 7,300 city-pairs worldwide in the third quarter of 1999 as compared with 1,400 city-pairs in the third quarter of 1992. The United/Lufthansa alliance increased the number of city-pairs served from roughly 1,700 in the third quarter of 1992 to nearly 3,900 in the third quarter of 1999.

Passenger traffic between the U.S. alliance markets and the Far East, Middle East, and Africa has increased at an even greater pace than that to European destinations, which were already fairly

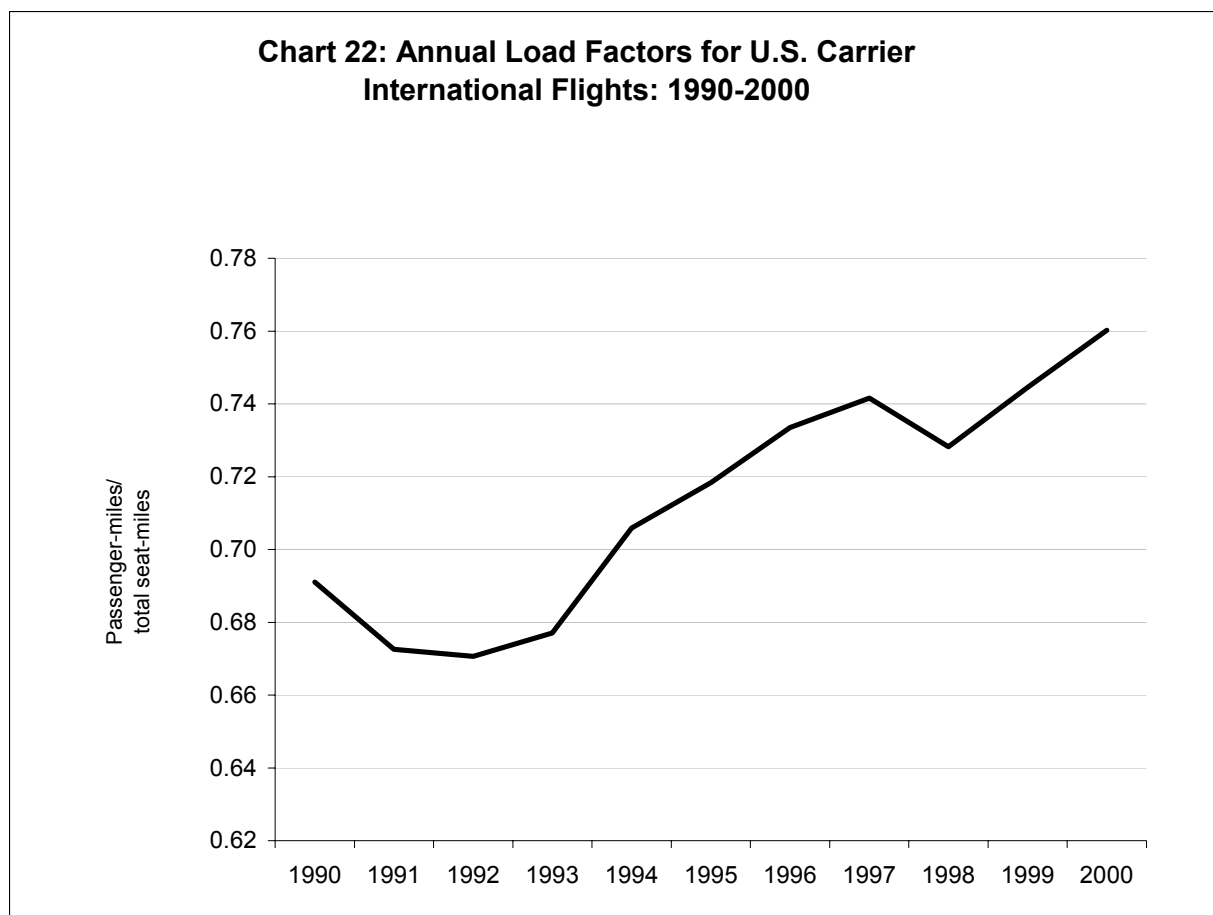
¹⁹² The World Tourism Organization estimated global international tourism receipts of \$514 billion in 2003. www.world-tourism.org/newsroom/Releases/2004/june/data.htm

¹⁹³ International Aviation Developments, Second Report, *Transatlantic Deregulation—the Alliance Effect*, U.S. Department of Transportation, Office of the Secretary, October 2000.

¹⁹⁴ www.bts.gov/publications/us_international_travel_and_transportation_trends/focus.html

well serviced before the formation of the carrier alliances. As a result of the increased service and traffic to these regions, fares dropped during the 1990s for many alliance gateways. The greatest impact for air travel between the United States and Europe from alliance formation has been on routes involving small cities on both sides of the Atlantic. Some examples include the Birmingham, Alabama, airport, from which bidirectional traffic with small European cities increased by 99 percent from 1995 to 1999 while fares dropped an average 34 percent; and the Sioux Falls, South Dakota, airport, from which traffic with small European cities grew by 117 percent and fares fell by 33 percent between 1995 and 1999.¹⁹⁵

Technological exchange has also been a feature of some of the global carrier alliances and has helped to improve service (and thereby potentially affected market shares) for many carriers. Expanded networks, innovations in computer seat-demand modeling and Internet bookings have helped carriers to increase their international revenue passenger load factors, a measure of occupied seating capacity, from 69 percent in 1990 to 76 percent in 2000 (Chart 22).



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, "Airline Industry Traffic Statistics," special tabulation, August 10, 2001.

¹⁹⁵ Ibid.

In an effort to position aviation to further serve the global economy, the United States is working multilaterally to extend the benefits of liberalization through a multinational “open skies” agreement known as the MALIAT—the Multilateral Agreement for the Liberalization of International Air Transport. Current parties to this agreement include the United States, Chile, New Zealand, Brunei Darussalam, Singapore, Tonga, and Samoa.¹⁹⁶ As countries increasingly move to liberalize their international aviation regimes, more countries are expected to accede to it. The MALIAT permits the benefits of bilateral “open skies” to be multiplied geometrically, since each signatory enters into “open skies” relationships with all the other members. The MALIAT also provides new opportunities for investing in the airlines participating in the regime by eliminating many of the standard bilateral restrictions on foreign ownership. A cargo-only version of the MALIAT has also been developed recently.

European International Air Services—Evolving to a Common Market

Air services between the United States and each individual EU member state continue to be governed by bilateral agreements. Most of these agreements provide for relatively liberalized service between the parties, although a few are quite restrictive. For example, only two U.S. and two U.K. airlines are authorized to fly between the United States and Heathrow Airport in the United Kingdom, and only to certain U.S. airports.

Here, too, the European market is changing. The European Commission legally challenged in 1998 the right of eight EU member states (the United Kingdom, Denmark, Sweden, Finland, Belgium, Luxembourg, Austria, and Germany) to conclude bilateral air transport agreements with the United States. In November 2002, the European Court of Justice (ECJ) determined that certain aspects of those bilateral agreements were contrary to EU law.

In 2003, the United States entered into negotiations with the EC on behalf of the various EU member states to create a comprehensive agreement extending “open skies” to all 25 nations of the expanded European Union. If successful, this would create the largest fully liberalized international aviation market in the world, linking 26 countries, more than 700 million people, and trillions of dollars in annual trade into a single international aviation marketplace.

Unfortunately, in June 2004 European member states rejected the draft U.S.-EU aviation services agreement negotiated over the previous nine months by the EC and the U.S. government. Although U.S. and European officials have continued to discuss perspectives on resuming negotiations in 2005, it is unclear what near-term steps will be required to formally restart negotiations.

Competitive Impact

Liberalized international aviation markets benefit all aircraft manufacturers by stimulating demand for air services and thereby overall aircraft sales. Airlines can expand service by tailoring services to specific markets, taking advantage of a wider variety of aircraft size and

¹⁹⁶ “Open Skies Partners,” updated August 23, 2004. www.state.gov/e/eb/rls/othr/22281.htm

range, in turn creating new or expanded markets for a wide range of aircraft models. Instead of relying on a limited number of flights over long distances between countries with feeder operations between international hubs and domestic airports, passengers are able to fly directly from origin to destination.

Liberalized international markets have had the largest implications for long-haul, mid-sized aircraft. As a result of increased competition and the demand for greater service options, airlines are now serving many international routes with 200- to 350-seat airplanes (B777s/B767s or A330s/A340s) that previously were served by the largest commercial aircraft in service—the B747.

Boeing and Airbus appear to be focusing their business strategies in part on differing views of future markets. For example, Boeing touts their new 787 as well suited for longer, thinner routes (fewer passengers per plane). The newest Airbus offering—the 550-seat A380—is more geared toward long-haul, large-capacity flights between major international hub airports. Boeing appears to be banking on increased liberalization that will open up new markets and reduce the reliance on these traditional hub airports.

Large international airports will continue to play central roles in the global air transportation system due to the continuing demand for travel to key destinations, economies of scale, and infrastructure limitations. Regardless of the particular business strategies of private industry, the U.S. government will continue to press for increased liberalization of air services around the world. While the United States still is party to restrictive air transport agreements with a number of countries (some of them major aviation markets), even these countries are starting to look carefully at current global trends and are working to ensure that they do not get left behind.

9.b. Air Traffic Management

Improved airborne, air traffic management (ATM) ground capabilities, and related procedures can increase capacity (airport, airspace) and reduce the environmental impact of aircraft operations. U.S. and European authorities are seeking to enhance/upgrade their air traffic management systems. These changes maximize support to the air transportation and aerospace communities when complementary equipment and operational opportunity are maintained.

National Authorities

The U.S. Federal Aviation Administration (FAA) has primary responsibility for U.S. civil aviation policy and regulation. Under that authority, the FAA is responsible for the certification of U.S. civil aviation equipment and personnel, development and operation of the U.S. ATM system, and system safety. For example, the FAA operates a variety of air transportation facilities (airport control towers and approach control facilities, air route traffic control centers, and flight service stations). It builds, installs, and operates visual and electronic aids to air navigation and air traffic control (communications equipment, radar facilities, air traffic automation systems). The FAA also develops air traffic rules and procedures, establishes criteria for and manages the use of airspace, and controls air traffic.

The FAA also engages in efforts to harmonize the rules and procedures applied in U.S. and international airspace and facilitates the global operation of aircraft through bilateral and multilateral agreements, international standards, and operating procedures.

The FAA continuously seeks to improve and upgrade the air transportation system through short- and medium-term plans such as the FAA Administrator's five-year Flight Plan and the 12-year FAA Operational Evolution Plan (OEP). These plans focus primarily on the structure and operation of the domestic U.S. air transportation system, although many of the standards and procedures adopted by the United States are developed in coordination with international partners and endorsed by the International Civil Aviation Organization (ICAO).

Many reports in recent years have highlighted the need for a transformation of the U.S. air transportation system and a departure from the past practice of incremental technology and procedure upgrades. Most recently, the National Research Council issued a September 2003 report, Securing the Future of U.S. Air Transportation: A System In Peril, highlighting several deficiencies in the U.S. air transportation system. The report recommends improved management and oversight of the system and long term operational and technological upgrades. Similarly, the Commission on the Future of the U.S. Aerospace Industry recommended transformation of the air transportation system as a national priority. The 1997 National Civil Aviation Review Commission chaired by Norman Mineta, now the Secretary of Transportation, called for dramatic changes in the way that the air traffic system and airport developments are managed and financed. Multiple studies and commissions throughout the 1990s documented similar problems and recommendations.

The paradigm of incremental upgrades is changing. The departments of Transportation, Commerce, Defense, and Homeland Security; the Federal Aviation Administration; and the National Aeronautics and Space Administration (NASA) have developed an integrated plan for transforming the U.S. air transportation system over the next 20 years to a next-generation system that would enhance safety and greatly expand the system's capacity. The structured forum for developing the plan, established with congressional guidance, is the Joint Planning and Development Office (JPDO).

The integrated plan, completed in December 2004, takes a comprehensive systems approach to assess the air transportation system from airport curb to airport curb, departure to destination. It focuses on incorporating new technologies and operational procedures into the system, coordinating U.S. government action on policy issues, and improving the management and oversight of the air transportation system to accommodate future growth, reduce costs, and improve safety and security of the system. This initiative embodies the transformation that has been widely recommended in recent years. The function and structure of the initiative, including participating agencies, are established in the "Vision 100—Century of Aviation Reauthorization Act" (P.L. 108-176).

Consistent with the plans for transformation in the longer term, the FAA is engaged in development and deployment of nearer-term technological and procedural enhancements through

the Flight Plan and the OEP. For example, the National Airspace Redesign (NAR) initiative will add capacity and improve the efficiency of air travel and transport by reviewing, redesigning, and restructuring the nation's airspace to meet the rapidly changing and increasing operational demands. The NAR encompasses domestic and oceanic airspace.

The management and control of European airspace is much more fragmented than in the United States. Various national and pan-European authorities regulate and manage European airspace. For the most part, individual EU member states are responsible for managing operations within their own airspace. In most cases, EU governments have at least partially privatized the provision of air traffic services.¹⁹⁷

Some elements of European airspace are managed at a European regional level by the European Organization for the Safety of Air Navigation (EUROCONTROL), which currently numbers 33 European member states. According to EUROCONTROL statements, its primary objective is to develop a seamless, pan-European ATM system that will accommodate growth in air traffic while maintaining a high level of safety, reduce costs, and respect the environment.

EUROCONTROL develops and coordinates short and long term pan-European ATM strategies and associated action plans in coordination with national regulatory authorities, air navigation service providers, civil and military airspace users, industry, and other European institutions. EUROCONTROL provides central air traffic flow management and regional air traffic services, collects air navigation charges, conducts research and development, and provides training and advice for air navigation services. Experts based in several European countries provide the technical and operational expertise to take ATM concepts from the blueprint stage to air traffic control facilities, flight decks, and airports.

The European air transportation system is undergoing a transformation. The European Commission is seeking to further integrate the management and oversight of European airspace through the “Single European Sky” initiative. In October 2001, the EC adopted a package of proposals designed to create a “Single European Sky” by December 31, 2004. The package established objectives in six key areas: joint management of airspace, establishment of a European Community regulator, integration of civil and military airspace management, formal linkage between the European Union and EUROCONTROL, introduction of new technology, and better coordination of human-resources policy. Three specific measures include provision of air navigation services, organization and use of airspace, and interoperability of equipment.¹⁹⁸

The proposed measures ultimately are intended to establish a decision-making and regulatory framework to restructure the European Union’s airspace on the basis of traffic flows instead of national boundaries. This would establish a unified management system for European airspace combining air traffic control for the 25 EU member States and other EU aviation partners under a single set of air traffic control regulations. One critical milestone toward development of a “Single European Sky” was the establishment of the European Aviation Safety Agency (EASA) in September 2003, which now is responsible for aviation safety certification across the EU. In December 2003, the European Parliament and European Council agreed to establish a “Single

¹⁹⁷ Civil Air Navigation Services Organization (CANSO), List of Membership www.canso.org

¹⁹⁸ EC IP/01/1398, October 10, 2001.

European Sky” Committee, which sought to complete the air transportation system regulatory framework by the end of 2004.

International Collaboration

There is a great deal of international collaboration in the development and management of airspace. Much of this collaboration is done multilaterally through ICAO, where member states jointly develop global standards and recommended practices (SARPs) as well as guidance material related to all aspects of civil aviation. In recent years, ICAO member states have undertaken extensive work in areas ranging from all-weather operations to automation of air traffic services to development of a global navigation satellite system (GNSS) concept. These new technologies and procedures all support a transition to a future communications, navigation, and surveillance/air traffic management (CNS/ATM) system defined by ICAO and adopted regionally and globally by all member states.¹⁹⁹

The FAA and other U.S. federal agencies have a long history of bilateral collaboration with European member states, the European Commission, and EUROCONTROL on various air transportation system matters. The FAA recently revised its memorandum of cooperation (MOC) with EUROCONTROL governing cooperative activities related to air transportation. Officials from the FAA, the European Commission, and EUROCONTROL work together to harmonize and align related programs to the extent practicable to ensure interoperability of air transportation systems and procedures between the United States, Europe, and neighboring airspace.

Competitiveness Impact

Air transportation system policies, standards, and procedures in general are usually intended to affect all operators equally and have no competitive impact on manufacturers of one nationality or another. Industry and government leaders have invested significant resources and effort to further the goal of global interoperability through global standards and procedures and harmonized requirements.

This does not mean that all manufacturers produce identical equipment or that all air traffic control systems are the same. Aircraft manufacturers compete by developing innovative equipment that meets performance-based standards and requirements for safety, environmental impact, etc. Much of the current air traffic control infrastructure is based on the ground (not in the plane), and most communication between controllers and pilots takes place by voice over radio. The relatively limited integration of air- and ground-based equipment and emphasis on common standards and procedures means that, for the most part, Boeing or Airbus aircraft can be

¹⁹⁹ It should be noted ICAO is not required to have only one solution—only one SARP. Its goal is to agree to a level of commonality but, as in the case of VHF digital link (VDL) communications, standardization may include three or more solutions. For example, the United States and Europe have a common standard for ADS-B (Automatic Dependence Surveillance-Broadcast) equipment in aircraft that traverse both airspaces—Mode-S, but differing solutions for the portion of the aviation community identified as “lower performance.” Yet each solution is consistent with a recognized standard.

flown in U.S., European, or other airspace.

Future systems will be different from those of today. There likely will be much greater integration of airborne and ground-based systems and a greater focus on automation. Airspace management will be increasingly reliant upon information networks and digital communications between aircraft and ground- or space-based assets. Pilots and controllers will have more automated decision-making tools. More operational decisions (and capabilities) will be based in the aircraft themselves. New ATM systems will expand the capacity of the air transportation system through more efficient routing, reduced vertical and horizontal separation minima, reduced environmental impact of aircraft, and enhanced security.

This transformation has multiple implications for aircraft and avionics manufacturers, service providers, and even operators of the system. New technology will be integrated into aircraft fleets. Service providers will have new capabilities as well as responsibilities. Increased overall capacity in new air transportation systems may reduce some of the relative reliance on traditional large hub airports, thereby leading to a greater increase in utilization of smaller aircraft and more frequent flights. New business models based on different types of aircraft (UAVs, RJs, smaller jets) and new technologies may become viable.

New global standards and procedures will need to be adopted in step with these advances. Otherwise, increasing specialization and integration could lead to divergence between automation systems, limiting the ability to use aircraft in some markets or requiring aircraft to be equipped with multiple systems to fly in multiple markets, an expensive and potentially unsafe option. Differing operating and emergency procedures in different regions of the world would require duplicate training requirements and pose a potential threat to safety in light of the expansion of international operations.

9.c. Airport Infrastructure

U.S. and European aviation authorities have regulatory and safety oversight of airports within their borders. However, there are significant differences among the airports in terms of management, ownership, control, and financing. The FAA provides more centralized planning and financing for airports than its counterpart European Aviation Safety Agency (EASA), but it does not own²⁰⁰ or operate any airports, unlike some of the EU member state governments.

U.S. and European airport development and operations are largely based on ICAO standards and recommended practices. ICAO technical guidance on airport planning, design, oversight, and management is included in ICAO Annex 14, Volume 1—Aerodrome Design and Operations, and Volume 2—Heliports as well a number of technical documents. ICAO also provides guidance on such subjects as organizational structures of airports, financial management, charging systems, financing of airport infrastructure and development, and management of non-aeronautical activities.

²⁰⁰ There are two exceptions to this statement – the U.S. government owns two commercial service airports: Reagan Washington National and Washington Dulles International airports. Since 1988, operation of these airports was transferred by statute from the U.S. Federal Aviation Administration to the Metropolitan Washington Airports Authority which leases the two airports from the U.S. government.

ICAO members concluded in August 2003 a review of the nature of economic regulation of airports by the Airports Economics Panel. This panel reaffirmed the general principle that each state has the right to choose the most appropriate ownership and control structure for its airports and air navigation facilities, so long as aviation safety and security is maintained or improved. Each state should decide which type of economic regulation mechanism best suits its individual characteristics and environment. The U.S. government believes that member states, regardless of ownership type, must retain appropriate oversight to ensure safety and security of operations, promotion of competition, and fair and open access to air navigation and airport services.

National Authorities

There are over 3,300 public-use airports in the United States that the FAA has determined to be vital to the U.S. air transportation system.²⁰¹ These airports provide aviation system access to all but 5.4 million people of the U.S. population²⁰² and are included in the National Plan of Integrated Airport Systems (NPIAS).²⁰³ Jet aircraft, ranging from small business jets to large commercial aircraft, can use these airports as long as there is adequate runway length.

Airports are developed based on criteria contained in FAA publications, such as the *Airport Design Guide*. The design requirements are based on the type of aircraft using the airport and take into such factors as wingspan, approach speed, and aircraft weight. Airport planning is the process that provides guidelines for future airport development that will satisfy aviation demand in a financially feasible manner while considering the aviation, environmental, and socioeconomic issues existing in the community. The FAA has a legislative mandate to *plan* a national system of airports, but the FAA does not *develop* airports since state and local governments control airport zoning decisions and airport proprietors have certain control over airport development in connection with their authority to control airport noise.²⁰⁴

The airport master plan is the most common tool used to formulate the long term development for an airport. The FAA does not require the preparation of a master plan, although airports are encouraged to undertake such efforts to identify future needs. The FAA has no approval authority on a master plan, nor is a master plan required for project approval.

The airport master plan is a concept of the long term development of an airport. The master plan report contains the details, logic, and justification for the development plan. Master plans are prepared to support the modernization of existing airports regardless of size, complexity, or role. The plan can be used to solve a particular problem, or it can be used to guide the future role of the airport within the community. The content and issues addressed in a master plan will vary depending on the complexity and problems of the individual airport.

²⁰¹ This number does not include the 2,000 public-use airports that have not met FAA criteria to be included in the National Plan of Integrated Airport Systems (NPIAS).

²⁰² Measured as within 20 miles of an NPIAS airport.

²⁰³ <http://faa.gov/arp/publications/reports/index.cfm>

²⁰⁴ Planning consists of guidance on how to design, build, and operate an airport in compliance with applicable regulations.

The FAA plays several roles in the planning for the nation's airports. Its primary role is to provide guidance and assistance to airport sponsors²⁰⁵ on a wide range of issues associated with airport planning. In doing this, the FAA ensures that appropriate planning techniques are applied and all federal regulations²⁰⁶ are met. FAA approval authority is limited to the forecasts of activity, site selection for new locations, airport layout plans, and environmental processing. However, FAA provides leadership in planning and developing a safe and efficient national airport system to satisfy the needs of the aviation interests of the United States, with due consideration for economics, environmental compatibility, local proprietary rights, and protection of public investment. It does this by developing certain criteria applied to all airports nationwide, regardless of their location. FAA also provides guidance on planning for state, regional, and metropolitan airport systems such as the types and locations of airports needed to meet the demand for air transportation.

Local and state governments are responsible for formulating plans to accommodate forecasted growth in air travel in their communities. While airport planning and development are local functions, the FAA plays an important support role, providing financial and technical assistance. For example, funds from the Airport Improvement Program (AIP) trust fund may be used on approved airport projects. AIP funding supplements funds derived from airport bond issues, which are financed through local revenues generated by the airport, such as through terminal leases or concessions. It also supplements revenues derived from passenger facility charges levied by airports, which are federally approved charges imposed for eligible airport projects. Airport revenues must be spent on airport projects, and may not be put into a sponsor's general fund for other non-airport improvements.²⁰⁷ Except in circumstances when safety or security issues require compliance with applicable regulations, decisions to implement any proposed action are largely local decisions.

The airport sponsor ultimately makes the decisions regarding airport development. In some cases, the FAA is very active in helping the sponsor form a plan of action, in particular if the airport sponsor requests the FAA to play a proactive role in the planning process. In other cases, it may not try to influence local decisions. The FAA has observed that the most successful airport planning and development efforts (e.g. those that are readily accepted and implemented) involve an effective partnership of local communities, airport operators, airlines, and the FAA. While the FAA does not advocate that airport authorities build new runways—a local decision—it will support those efforts when the project is justified and meets all applicable planning and design requirements while maintaining environmental integrity.²⁰⁸

²⁰⁵ Airport sponsors are entities that have legal authority to enter into agreements with the federal government. Often, airport sponsors are also airport owners. However, airports could be owned by one entity—such as a city or a town—and operated by a separate entity such as an airport authority.

²⁰⁶ 139 C.F.R. Part 77, Compliance.

²⁰⁷ Certain airport sponsors enjoy limited exceptions to the revenue-use rule, due to financing arrangements that predate the rule.

²⁰⁸ All projects must comply with the National Environmental Policy Act (NEPA). If a project would cause an adverse environmental impact, adequate mitigation measures must be identified, approved, and implemented along with the proposed project.

During the planning process, local governments are encouraged to consider a range of measures for meeting forecasted growth, including improvements to existing airports, new airports, or shifts to other modes of transportation. Based on a review of local planning efforts, the FAA believes that most of the increased demand for air transportation will be accommodated through development programs at existing airports and better use of all airports serving metropolitan areas (instead of building entirely new airports).

However, changes in the national airport infrastructure may be needed to accommodate increased future demand as well as new technologies and procedures that may be part of the next-generation air transportation system. Where expansion of existing airports is not practical or feasible, new means may need to match demand with capacity to reduce or avoid congestion and travel delays. The FAA is reviewing federal airport policies and funding in coordination with other federal agencies through the Joint Planning and Development Office.

While the FAA in the United States uses the conceptual framework of the National Plan of Integrated Airport Systems for planning purposes, it does not appear that the European Union has progressed to the same level of integration for airports of member states. In many respects, airport policies within individual member states of the European Union reflect the various systems of ownership, management, and funding of each country.

Regulatory oversight of European airports is being consolidated with the creation of the European Aviation Safety Agency (EASA) as described in Section 8.a. Among other goals, EASA will be responsible for the safety oversight of airports and air traffic services operators.²⁰⁹ Prior to establishment of EASA, airport-related regulations had been the responsibility of national civil aviation authorities and were coordinated through the Joint Aviation Authorities.

There are many forms of airport ownership throughout the European Union, such as direct national ownership, national-local partnerships, state holding companies, chambers of commerce, etc. For example, France, Spain, Greece, Sweden, and Finland have retained their airports under national control, while the United Kingdom and Germany have sold all or part of their airports to the private sector. In France, Aéroports de Paris (ADP) is responsible for the construction, operation, and development of all airports within a 50-kilometer radius of Paris. ADP is a public corporation under the authority of the Minister of Civil Aviation and is controlled by the Ministry of Finance. In Greece, 42 civil airports are owned and managed by the Hellenic Civil Aviation Authority. In the United Kingdom, BAA plc owns and operates seven airports, including London Heathrow. However, the U.K. government still plays an important role in airport policy.

As a result of the diversity in systems of ownership, management, and control of airports in member states, the public financing regimes are equally as diverse. In general, public financing for capital improvements are made available through grants and loans from national, regional, and local governments. However, the availability of public financing differs greatly from country to country.

²⁰⁹ www.jaa.nl

Financing is also available at the EU level in the form of loans and grants through a number of institutions assisting airport development. The European Regional Development Fund (ERDF) and the Transport European Networks (TEN) program provide grants, while airport loans have been made available through the European Investment Bank. ERDF is primarily used for support financing for infrastructure projects in development regions of the EU. The TEN program is intended to reinforce social and economic cohesion by improving the interconnection and interoperability of national networks. The European Investment Bank has played a significant role in financing airport development. One of its objectives is to support European integration and economic and social cohesion.²¹⁰

Competitiveness Impact

In general, federal airport policies do not favor operations of aircraft from one particular manufacturer over another. Decisions to expand, build, or modify U.S. airports to accommodate operations of new aircraft models for the most part are made by local authorities with limited input from the FAA. Local authorities make these decisions based on an assessment of the commercial benefit to local operations of adding new types of service or facilitating airport expansion. Similarly, expansion and development of European airports also are largely based on local or regional decisions.

However, the FAA works very closely with airports to adjust to changing trends in the aviation industry. Such changes include the addition of the A380 to the aircraft fleet flying into U.S. airports. Although no U.S. passenger air carrier has purchased this aircraft, foreign flag carriers may begin flying this aircraft into U.S. airports as early as 2006. As of the end of 2004, FedEx was the only U.S. cargo airline to announce an order for A380s. However, the addition of the A380 to the cargo aircraft fleet will have only a limited impact on U.S. airport operations, since FedEx's cargo operations are largely segregated from passenger terminals at most airports.

Airport terminals may have trouble accommodating this new aircraft because the 262-foot wingspan is 50 feet wider and will seat approximately 100 more passengers than the largest aircraft in commercial service today. Modifications to the airport infrastructure, on the runway and taxiway system as well as the terminal complex, may be necessary. It is anticipated that four airports in the United States (JFK/New York, LAX/Los Angeles, SFO/San Francisco, and MIA/Miami) will initially be served by the A380, with five additional airports within several years (Memphis, Anchorage, Washington Dulles, Orlando, and Chicago O'Hare.)

Planning for the addition of these new aircraft began even before the A380 program was officially launched. As early as 1997, the FAA began discussing with government and industry stakeholders the planning and operational needs of airports for accommodating these larger airplanes at existing facilities. The New Large Aircraft Facilitation Group (NLA FG) reviewed issues of how aircraft in this general category would affect the airport environment, air traffic control, aircraft rescue and fire fighting, ground service handling, and other relevant operational areas. The FAA's work formed the foundation for SARPs related to accommodation of new

²¹⁰ *Study on Competition between Airports and the Application of State Aid Rules*, Air Transport Group, School of Engineering, Cranfield University.

larger airplanes published by ICAO in 1999, followed by subsequent operational guidance for airports that are physically constrained for a variety of reasons and thus are unable to meet the provisions of the SARPs.

The FAA will support the U.S. airports financially, as described above, to ensure that the infrastructure is in place when the A380 begins operating at U.S. airports. Such funding would be in line with past practice of funding modifications required with the introduction of new aircraft—both Boeing and Airbus. For example, many taxiway turns (fillets) will not be able to accommodate the longer and wider landing gear of the Airbus 340-600 and the Boeing 777-300. FAA has provided funding to many of these affected airports to widen the taxiway fillets.

Work is underway at the relevant U.S. airports to prepare them for A380 operations. Although the airports report that they will be ready to accommodate A380 flights on schedule,²¹¹ some airlines have expressed concern that the airport renovations are going too slowly. Virgin Atlantic announced in May 2004 that it is delaying delivery of its first six A380 aircraft by 18 months, due to concerns about the ability of airports (in particular Los Angeles's LAX) to handle the aircraft effectively.²¹²

²¹¹ "Major Airports to be Ready for Airbus A380," May 18, 2004, <http://www.msnbc.msn.com/id/5006225>; "New York Kennedy Funded For A380 Strengthening," April 14, 2004, www.aviationnow.com.

²¹² "Virgin Atlantic Delays Deliveries," *Financial Times*, May 17, 2004.

Chapter 10 – Business Operations and Security Regulations

10.a. Export Controls

Export controls directly impact international trade in civil aerospace products due to multiple uses for aerospace platforms and components. The technology base that supports the military aerospace industry is common to that which supports the civil aerospace industry. While in most cases the hardware is designated as uniquely military or civil in nature, there is a growing population of aerospace systems that are considered either to be civil or military systems based upon relatively minor modifications or differences. This crossover is relevant because different export licensing rules apply to the military and civil versions. As the number of such products increases, export controls will have an increasing impact on trade in commercial aircraft.

Export licensing rules also affect international collaboration on development of new commercial aircraft. U.S. companies collaborating on new commercial aircraft programs with aerospace engineers and designers in other countries must apply for export licenses to share technical data that is export controlled because of some sort of application in a military aerospace product. This becomes increasingly relevant as first- and second-tier manufacturers evolve into system integrators who rely on non-U.S. companies to design, develop, and produce structures and components for new products. U.S. and European policies need to be reviewed and modified as necessary to protect national security without unnecessarily hampering commercial sales.

National Authorities

The Commerce Department's Bureau of Industry and Security (BIS) is charged with the implementation of U.S. export control policy on dual-use commodities, software, and technology. Dual-use items subject to BIS regulatory jurisdiction have predominantly civilian uses, but also have conventional arms, weapons of mass destruction, and terrorism-related applications. One of BIS's principal objectives is to ensure that direct exports from the United States and re-exports of certain items from third countries are consistent with U.S. national security and foreign policy interests, without imposing unnecessary regulatory burdens on U.S. exporters or unduly impeding the flow of legitimate trade.

BIS implements export controls in the export administration regulations (EAR), under the statutory authority of the Export Administration Act of 1979 (EAA), as amended, and the International Emergency Economic Powers Act (IEEPA). Items subject to the EAR are dual-use items that are U.S.-origin, the direct product of U.S.-origin technology, or foreign-produced items with greater than the *de minimis* percentage of "controlled" U.S. content. BIS maintains a Commodity Control List (CCL), which describes items that are controlled for export based on their technical specifications. Items subject to the EAR but not specifically listed on the CCL generally do not require a license to most destinations.

BIS seeks to promulgate clear, concise, and timely regulations setting forth license requirements and licensing policy for the export of dual-use items. Principal areas of focus include implementation of controls agreed to in the four multilateral export control regimes: the Missile Technology Control Regime (MTCR), the Wassenaar Arrangement (WA) (conventional arms

and dual-use goods and technologies), the Nuclear Suppliers Group (NSG), and the Australia Group (AG) (chemical and biological nonproliferation).

The Missile Technology Control Regime (MTCR) is an export control arrangement among 33 nations, including some of the world's most advanced suppliers of ballistic missiles and missile-related materials and equipment. The regime establishes a common export control policy among parties based on a list of controlled items and on guidelines that member countries follow to implement national export controls. The goal of maintaining the Annex and the Guidelines is to stem the flow of missile systems capable of delivering weapons of mass destruction to the global marketplace.

The Wassenaar Arrangement is a multilateral arrangement regarding export controls on conventional arms and sensitive dual-use goods and technologies. Wassenaar was founded in 1996 to replace the East-West technology control program under the Coordinating Committee on Multilateral Export Controls (COCOM) regime that ended in 1994.

Wassenaar was designed to promote transparency, the exchange of views and information, and greater responsibility in transfers of conventional arms and dual-use goods and technologies. Through their national policies, Wassenaar members seek to ensure that transfers of arms and dual-use goods and technologies do not contribute to the development or enhancement of military capabilities that undermine international or regional security and stability. Members' policies also seek to ensure that such goods and technologies are not diverted to support those military capabilities. Wassenaar does not target any state or group of states. All measures undertaken with respect to Wassenaar are in accordance with national legislation and policies of member countries, and are implemented on the basis of national discretion.

Wassenaar Arrangement members undertake to maintain effective export controls for the items on the agreed control lists, which are reviewed periodically to respond to technological developments. They also exchange information on license actions.

All of the major aircraft manufacturers are in countries that are a party to the Wassenaar and the MTCR. While these regimes provide some latitude for a country's discretion on how it controls the export of aerospace items (hardware, technology, and software) there is agreement on which items are controlled under the individual regime control lists.

Export administration regulations also further other U.S. foreign policy interests, including sanctions policies against specific parties or countries that have violated U.S. export law, have sponsored weapons of mass destruction programs of concern to the United States, or that are under embargo. The EAR specifies which export licensing agency has jurisdictional authority for a given item and clarifies the rights and obligations of U.S. exporters.

Under the Commerce Department's EAR, lower-level aerospace items can generally be exported without a license, while higher-level items may require a license depending on the country of destination and/or end-use or end-user. The vast majority of commercial (or civil) aerospace trade occurs without significant government intervention.

In 2004, for example, the Commerce Department processed 568 licenses for civil aircraft-related hardware and technology worth \$231 million. A significant portion of these licenses include licenses for the export of aerospace technologies, which do not have a dollar value. These licenses constitute less than 5 percent of the total number of export license applications processed by the Commerce Department in 2004. The average processing time for these licenses was 71 days. This processing time is nearly double the overall average processing time for all BIS license applications, given the technologies, countries, and end-users involved. However, less sensitive aerospace parts and components can be exported without a license as long as exporters comply with the pertinent regulatory requirements.

The State Department's Directorate of Defense Trade Controls (DDTC) is charged with controlling the export and temporary import of defense articles and defense services covered by the U.S. Munitions List (USML). DDTC processes license applications for defense trade exports and handles matters related to defense trade compliance, enforcement, and reporting. The Arms Export Control Act (AECA)²¹³ and the International Traffic in Arms Regulations (ITAR)²¹⁴ govern DDTC's activities.

European export controls affecting civil aircraft and equipment are largely the same as those of the U.S. government, with the exception of civil aircraft exports to countries that the United States has identified as state sponsors of terrorism. European governments are parties to the MTCR and the Wassenaar regimes. The EU member states each have separate but similar regimes for controlling export of military and dual-use items. The European Union has established a dual-use export control regime that member states are responsible for implementing through national law.²¹⁵

- Germany's export control policy derives from two domestic laws—the War Weapons Act (KWKG) of 1961 and the Foreign Trade and Payment Act (as amended in 1997). The KWKG covers exports of missiles, fighter airplanes, helicopters, warships and essential parts. The Foreign Trade and Payment Act covers dual-use materials and those arms not covered by the KWKG. Items covered by the KWKG can only be exported under special exemption license. Items under the Foreign Trade and Payment Act are exportable except where “inconsistent with the security of the German State.” These acts also apply to jointly developed items in the case of export to third countries.²¹⁶
- U.K. export control policy is contained in the Export of Goods, Transfer of Technology and Provision of Technical Assistance Order 2003; and the Trade in Goods (Control) Order 2003, which took effect May 1, 2004. Additional controls introduced under the Trade in Controlled Goods (Embargoed Destinations) Order 2004 came into effect on March 3, 2004. The new legislation consolidates previous export controls on the export of both military and dual-use goods, software, and technology (the Export of Goods

²¹³ 22 U.S.C. 2778-2780.

²¹⁴ 22 C.F.R. Parts 120-130.

²¹⁵ Council Regulation (EC) No. 1334/2000 of June 22, 2000, modified by Council Regulation (EC) No. 2889/2000 of December 22, 2000 and Council Regulation (EC) No. 458/2001 of March 6, 2001.

²¹⁶ Information provided by U.S. Embassy—Berlin.

[Control] Order 1994, as amended, and the Dual-Use Items [Export Control] Regulations 2000, as amended).²¹⁷

- French export control policy is included in Order in Council of October 2, 1992, relating to procedures for importing and exporting war materials, arms and munitions, and analogous material (modifying inter alia Decree No. 73-364 of March 12, 1973, as modified).²¹⁸
- Spanish export control policy is included in Royal Decree No. 491/1998 of March 12, 1998.²¹⁹

Export controls are intended to protect national security, and do serve as the first line of defense in limiting the proliferation of sensitive technology. While U.S. and EU manufacturers do face a regulatory burden in adhering to these controls, the U.S. government does attempt to mitigate the burden by engaging with U.S. partners in multilateral export control regimes and with U.S. industry to adjust controls to technology. However, the differences between national systems that do exist usually provide European manufacturers a competitive advantage over their U.S. counterparts. Due in part to the significant U.S. content in European aircraft, most European aircraft manufacturers' products are impacted either directly by the de minimus controls or by controls affecting export of U.S.-origin spare parts.

Competitiveness Impact

From an export licensing perspective, the issues that impact the Boeing/Airbus competition for international market share fall into several categories.

Bureaucracy—Not at the Speed of Business

Export control systems must continually evolve to fit a changing world of increasing global economic integration and rapid cross-border flows of information, technology, and labor. Some aspects of the current export control system such as country groups and licensing rules stem from the Cold War. The Commerce Department's Bureau of Industry and Security (BIS) has made some changes to reflect the post-Cold War realities, including: (1) adding new NATO members to the EU license-free zone for encryption; and (2) undertaking a larger project to revise the country groups in the EAR to better reflect the current geopolitical order. Despite these efforts, more work is needed to reflect the new global marketplace. Globalization has fundamentally affected the way companies—including aerospace companies—conduct business. New programs like the Boeing 787 program will involve non-U.S. companies in aircraft design, development, and production. And while the effects of globalization and economic interdependence have generally been positive for this industry, given the importance of global customers and the limited number of manufacturers, globalization has led to new challenges and even threats.

²¹⁷ Introduction to the Export Control Organization, <http://www.dti.gov.uk/export.control/help.htm>

²¹⁸ <http://projects.sipri.se/expcon/db1.htm>

²¹⁹ Ibid.

One obstacle is the timeliness and flexibility in the licensing of technology necessary to make a foreign party a part of the development team. In the United States, this process for dual-use items is governed by an executive order that authorizes the departments of State, Defense, and Energy to review all license applications within 39 days of registration of the license application by BIS. This system typically produces license conditions that may substantially limit Boeing's or any of its major subsystem developers' flexibility to maximize the capability of the foreign vendor. European companies enjoy a competitive advantage in this area to the extent that they face lesser restrictions than their U.S. counterparts.

Another is the slow process for reviewing applications by all necessary government parties. In the United States, federal agencies have been seeking to streamline electronic information sharing among themselves for processing license applications and commodity jurisdiction requests. Electronic enhancements would enable the reviewing agencies to have access to the necessary technical data in real time, thus making their review more efficient and effective. However, the program to provide full electronic connectivity between the three departments has not progressed as rapidly as anticipated. Enhancements to Commerce Department database systems²²⁰ have been suspended due to program costs and lack of closure on required capability. BIS is reevaluating its priorities and options to achieve the same objectives. The State Department is proceeding with its own electronic licensing system upgrades, but to date the Commerce Department does not have electronic connectivity to the Office of Defense Trade Controls—the managers of the Commodity Jurisdiction review process.

Export Control Policies Limit Global Sales or Operations

After a product is developed, the United States maintains export restrictions on a number of potential markets due to anti-terrorism or embargo reasons. Not only are these restrictions applicable to the initial sale of the aircraft, but the controls stay with the aircraft throughout its life, thus impacting the ability of the initial buyer to dispose of the aircraft when it is no longer needed. U.S.-origin spare parts and services also are restricted, making it difficult to operate such an aircraft to one of the destinations that have been embargoed, designated as a state sponsor of terrorism, or otherwise sanctioned. There is the possibility that U.S.-origin spare parts may be sent to some of these destinations for safety of flight reasons, but a license is often required and is considered on a case-by-case basis.

Demilitarized Products/Components—A Problem Area?

Two recent case studies illustrate problems that have arisen when demilitarized products or components have been caught up in U.S. regulatory jurisdictional disputes. In both case studies, U.S. and European aerospace manufacturers were directly affected. This longstanding movement between licensing jurisdictions is evidenced at all levels of product complexity, from large airframes to small components. The State Department's "see-through" rules allow even a small subpart to be controlled under strict ITAR requirements even though incorporated into a larger civil product. In such cases, sales of entire aircraft have been affected by export controls on very minor components.

²²⁰ SNAP Plus and enhanced ECASS.

For example, a jurisdiction issue arose when a version of the Quartz Rate Sensor (QRS11) chip was developed for use in the Commercial Standby Instrument System (CSIS) deployed in civil aircraft for navigation. The CSIS is civil certified and, as such, appeared to be under Commerce Department jurisdiction, based on the Commerce Department's statutory jurisdiction over standard equipment certified for use in civil aircraft.²²¹

In the fall of 2003, questions were raised as to whether the Commerce Department or the State Department had jurisdiction over this QRS11 chip. State Department jurisdiction would mean that every civil aircraft (both U.S. and foreign produced) that contained this QSR11 chip would be subject to the State Department's International Traffic in Arms Regulations (ITAR) and require a State Department license based on the see-through rule. Under the see-through rule, wherever an ITAR item is incorporated into a civilian item, the civilian item becomes subject to the State Department's export licensing jurisdiction. In February 2004, after discussions between the departments of Commerce and State and the Congress, the Commerce and State departments published rules that provided for the Commerce Department's jurisdiction of this chip if it was incorporated into a CSIS and used in a civilian aircraft. The impact of this jurisdictional determination affected new aircraft to be exported from the United States and components in transit for maintenance work or to be used as spare parts and temporarily grounded aircraft in operation around the world.

A similar issue took place with one U.S. company's inertial navigation system that has been civil certified for over 20 years and was used widely in commercial aircraft. This system has a gyro in common with another related inertial navigation system that was to be used on a military helicopter, and therefore the gyro required a State Department license. Exports of the inertial navigation system and civil aircraft incorporating that instrument were held up for a period of about a month until agencies could resolve the issue of which department had jurisdiction over the export license of the system.

Such incidents have a very detrimental impact on the desirability of items that are subject to U.S. export controls. This movement of aircraft and components from one agency's jurisdiction to another, even if only for a short time, causes costly delays in delivery, repair, and operation of equipment. As a result, U.S. suppliers appear unreliable. The impact of the QRS11 and inertial navigation system licensing incidents was especially significant to owners and operators that served markets such as China.

Similar challenges are likely to arise in the future. One notable example is the proposal to equip civil aircraft with defensive systems against man-portable air defense systems (MANPADS). The Department of Homeland Security has contracted with three companies (two from the United States and one from the United Kingdom) to study the effectiveness of adapting such equipment from military systems. Government officials are already working through the implications of the introduction of this technology into civil fleets so that commercial aircraft with this technology still can be exported and operated globally under Commerce Department

²²¹ EAA, Section 17(c).

export control jurisdiction.

The use of civil aerospace equipment for military purposes may further blur lines of jurisdiction. This is not a new consideration. For example, Pratt & Whitney's PW2037 engine, originally developed in 1980 for the B757, was modified in 1988 to become the F117-PW-100 to power the C-17 military transport. However, two recent defense acquisition programs indicate that this trend is on the rise. Boeing's new generation of military aerial refueling tankers are based on modified commercial 767 airframes, and Airbus's competing aircraft is based on modified commercial A330 airframes. The Navy recently selected Boeing to develop the Multimission Maritime Aircraft (MMA) for maritime reconnaissance and intelligence missions and, if necessary, combat missions against submarines or surface ships. Boeing's proposed MMA will be based on the 737 airframe.

There have been positive case studies as well. When night-vision cameras first began to be installed on civil aircraft to enhance the pilot's visibility for takeoff and landing in low-light conditions, agencies worked before the fact to straighten out any potential disputes over jurisdiction. As a result there was no disruption of the normal Commerce Department export control of such aircraft.

Uncertainty over whether some parts and subsystems widely used in civil aircraft are on the USML or the CCL has caused increasing uncertainty in the civil aircraft industry, and is likely to become a source of competitive disadvantage for the U.S. aerospace industry relative to its competitors. The above examples of the QRS11 chip and the inertial navigation system illustrate the disruptive nature of this issue for the U.S. industry. BIS has recognized the importance of this issue to the industry and will be working with other responsible agencies and industry in the near term to identify potential civil aircraft parts and components that may pose jurisdictional questions.

10.b. Security

Aviation security regulations and policies do not have a direct competitive impact on the U.S. jet transport manufacturing industry because they apply to aircraft operators—predominately commercial airlines—instead of to aircraft manufacturers. Those operators must comply with the same security regulations regardless of where their aircraft were manufactured. Nonetheless, security regulations and policies have an important and potentially increasing indirect impact on the manufacturing sector in two ways worth noting. First, they affect aviation service provider operations and costs, thereby affecting the ability of those operators to purchase, operate, and maintain aircraft. Second, requirements related to the aircraft themselves, such as mandatory installation of security equipment on aircraft, could affect various aircraft models in different ways, depending upon how those requirements are structured and how the aircraft are used.

Many aviation security requirements are coordinated internationally through ICAO. ICAO Annex 17 to the Chicago Convention and the associated security manual contain security-related SARPs and related guidance material on their interpretation and implementation.²²² In the wake

²²² *Security Manual for Safeguarding Civil Aviation Against Acts of Unlawful Interference*, (ICAO Doc. 8973 - Restricted).

of terrorist attacks on September 11, 2001, in the United States, ICAO adopted an Aviation Security Action Plan, including ICAO training programs and a global network of aviation security training centers.

National Authorities

The Department of Homeland Security (DHS) is responsible for protecting the movement of international trade across U.S. borders, maximizing the security of the international supply chain, and for engaging foreign governments and trading partners in programs designed to identify and eliminate security threats before these arrive at U.S. ports and borders. Following the attacks on September 11, 2001, security-related activities from federal agencies were consolidated in DHS.

The Border and Transportation Security (BTS) Directorate (including the Transportation Security Administration [TSA]) is primarily responsible for DHS aviation-related security activities. Some of these activities are carried out by TSA directly, including screening of passengers and cargo on commercial flights. Other activities, such as customs and immigration inspections, control of federal air marshals, etc., are directed by other organizations in BTS. Prior to establishment of DHS, U.S. airlines had been responsible for managing many aviation security activities including, most prominently, the airport checkpoint screeners according to requirements established by the federal government. Airlines continue to be responsible for other security measures affecting their operations, and airports are responsible for many security measures as well.

TSA regulates aviation service providers operating to, from, or within the United States through established security programs and their accompanying security directives and emergency amendments (EA) that dictate security-related requirements. For example, in addition to established security-program requirements, DHS has established new security requirements for passengers and airlines arriving from outside the United States. Airlines must now provide additional data on arriving passengers prior to arrival (and prior to departure in many cases.)

Some aviation safety and security responsibilities overlap between TSA and FAA and require coordination. For example, the FAA has issued requirements related to reinforced cockpit doors installed on commercial aircraft,²²³ whereas TSA has issued an EA that requires foreign air carriers to keep the cockpit door of aircraft closed from the airport of the last point of departure on flights to the United States.

European aviation security policy is becoming more harmonized than it has been in the past. The European Commission (which encompasses 25 European states) established competency in the area of civil aviation security and is in the process of developing regulations and ensuring their implementation throughout the European Union. Individual European Union member states are still responsible for establishing their own aviation security policies and requirements. However, the commission has legal oversight and sets the standards to be met by individual states. The EC recently has begun auditing airports to ensure that standards are being met by its

²²³ 14 C.F.R. Part 129.28, as amended on December 30, 2002.

member states. Aviation security responsibilities often are shared among civil aviation, justice, transport, and national security authorities, depending upon the country.

Aviation security policies are coordinated among members of the European Civil Aviation Conference (ECAC). Consisting of 38 European countries including the 25 EU member states, ECAC countries have agreed to use a set of recommended practices contained in Document 30²²⁴ to reach aviation security standards that exceed the requirements set forth by the International Civil Aviation Organization. While ECAC audits security measures at ECAC member state airports, the requirements of Document 30 are not legally enforceable.

International Collaboration

The U.S. government coordinates security policies to the maximum extent practicable with European authorities. U.S. officials meet directly with members of the European Commission and EU member states to discuss specific policies and implementation of security requirements. The U.S. government holds regular consultations with ECAC authorities on a variety of aviation-related issues, including security. In addition, scientific panels composed of members from the United States, Canada, and certain member states (but not necessarily all) of the EU meet on a regular basis not only to share information but also to collaborate on security equipment testing prior to operational installation. The structure of U.S.-European consultations has changed following the transfer of aviation security responsibilities from the FAA to DHS.

The United States has pushed ICAO to enhance aviation security worldwide by improving the standards and recommended practices governing aviation security, as well as the guidance material used by member states to meet those standards. Important changes to international standards were made following the events of September 11 and in light of the threat posed by al-Qaida and similar terrorist networks. The United States is working with European counterparts once again to strengthen international standards and ensure that the threat is adequately addressed.

Competitiveness Impact

Most aviation security policies and requirements affect all aircraft manufacturers the same way, regardless of their nationality. Passengers must go through the same security checkpoints and pay the same security-related fees as part of their airplane tickets, regardless of whether they are flying on a Boeing or an Airbus aircraft or a regional jet. The U.S. government has sought to maintain a balance between ensuring the security of the U.S. aviation system and facilitating the movement of people and goods.

Current aviation security policies and requirements clearly have an impact, albeit indirect, on U.S. aircraft manufacturers. U.S. airlines have expressed significant concern over a wide variety of security-related costs that affect their ability to purchase, operate, and maintain aircraft. Taxes and fees levied on airlines to pay for security requirements such as airport security screeners and other measures directly affect an airline's bottom line, either by increasing airline expenses or by reducing consumer demand through increased ticket prices. Consumer demand also is affected

²²⁴ Document 30 is ECAC's equivalent of ICAO Annex 17 on Security.

by the “hassle factor” associated with new security screening procedures criticized by many consumer groups. Privacy concerns about sharing of personal data with federal authorities have been raised by U.S. consumer advocacy groups as well as foreign governments.

A few aviation security requirements, such as mandatory security-related equipment, directly impact aircraft manufacturers but thus far have not provided one manufacturer a notable competitive advantage over another. For example, reinforced cockpit doors must be installed on U.S. as well as foreign-built aircraft if they are operated by U.S. carriers or in U.S. airspace. TSA consults with U.S. as well as foreign manufacturers and aircraft operators when designing and developing new security requirements. Thus far, most security equipment requirements have been met through retrofitting of existing aircraft models with FAA-certified equipment.

However, future security-related equipment requirements under consideration are likely to have an unintended but real competitive impact on aircraft manufacturers and operators, especially if those requirements vary depending upon the size of the aircraft (RJs vs. large jet aircraft) or the nature of the operation (cargo vs. passenger flights).

For example, federal authorities currently are considering measures to address the threat of man-portable air defense systems (MANPADS) to commercial aviation. This is a threat that must be taken seriously. A wide variety of alternative protective measures have been suggested, ranging from special takeoff or landing procedures to installation of equipment (flares, lights, etc.) intended to deflect or avoid missile strikes on aircraft. All of the solutions under consideration are likely to impose additional installation, maintenance, or operational costs on affected aircraft operators. Certain categories of aircraft or operators could enjoy a competitive advantage if they are exempt from the new requirements, are only required to meet lesser standards, or are inherently able to meet them more easily than those in other categories.

10.c. Mergers and Acquisitions

Government regulations related to private-sector mergers and acquisitions can have a somewhat disproportionate impact on aerospace companies, given the unique market dynamics and limited number of companies in the industry.

National Authorities

Merger reviews under U.S. antitrust law focus on preserving competitive market structures, ultimately to the benefit of consumer welfare. U.S. merger enforcement policy is focused on post-merger maintenance of healthy incentives for market participants to compete aggressively and engage in economically efficient activity. In recent decades, merger analysis has become more sophisticated and rigorous, reflecting that even mergers between sizable firms can improve efficiency and spur innovation. U.S. antitrust agencies today are skeptical of the “portfolio” theory, believing that the near-term efficiencies and competitive advantages that a conglomerate merger likely would produce generally will outweigh any speculative longer-term possibility that competitors could be driven from the market.

The U.S. government's antitrust authority comes from three major federal antitrust laws: the Sherman Antitrust Act, the Clayton Act, and the Federal Trade Commission Act. The Sherman Act outlaws all contracts, combinations, and conspiracies that unreasonably restrain interstate and foreign trade. The Clayton Act prohibits mergers or acquisitions that are likely to lessen competition substantially or to tend to create a monopoly. The Federal Trade Commission Act prohibits unfair methods of competition in interstate commerce.²²⁵ U.S. antitrust laws are enforced by both the Federal Trade Commission (FTC) Bureau of Competition and the Antitrust Division of the Department of Justice.²²⁶ In order to prevent duplication of effort, the two agencies consult before opening any case.

In addition to the standard consumer welfare concerns, merger reviews under European competition laws also focus on the creation or strengthening of a dominant position, a standard that assigns some negative weight to large asymmetries among manufacturers in the same industry. Europe's merger control regime has undergone significant change following the adoption of the Merger Regulation of December 1989²²⁷, which consolidated merger review authority in the European Commission Directorate General for Competition. The regulation removed the need to seek clearance for mergers and acquisitions of companies exceeding certain revenue thresholds in a myriad of EU Member State national regulatory regimes. The revenue threshold was lowered in 1997, further streamlining the review process.²²⁸

The EC characterizes the merger regulation as "based on an understanding that the establishment of the internal market would lead to major cross-border corporate reorganization, and that a level playing field was necessary to ensure that such transactions would not result in lasting damage to competition."²²⁹ The EU merger regulation prohibits concentrations that create or strengthen a dominant position and significantly impede competition (and therefore would likely result in higher prices and less choice and innovation). In applying that standard, the EU authorities have in some cases registered concern for existing competitors to a larger degree than would likely occur in the United States.

The European Commission launched a broad review of the merger regulation again in 2001 to identify changes needed to meet the challenges posed by global mergers, monetary union, market integration, enlargement, and the need to cooperate with other jurisdictions. This review resulted in a new merger regulation applicable as of May 2004.²³⁰ Among other changes, the new rules seek to clarify that merged companies will be judged based on whether "sufficient competition remains after the merger to provide consumers with sufficient choice," even if the merged company will not be "much bigger than the rest." The new standard of review delineates a

²²⁵ *Antitrust Enforcement and the Consumer*, U.S. Department of Justice.

²²⁶ The Department of Transportation has enforcement authority to take action or prohibit unfair and deceptive practices and unfair methods of competition by a U.S. or foreign air carrier.

²²⁷ Council Regulation (EEC) No. 4064/89.

²²⁸ COM(2000) 399 final, *REPORT FROM THE COMMISSION TO THE COUNCIL* on the application of the merger regulation thresholds, Brussels, June 28, 2000.

²²⁹ *Green Paper on the Review of Council Regulation (EEC) No. 4064/89*, COM(2001) 745/6 Final, Brussels, December 11, 2001.

²³⁰ COUNCIL REGULATION (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings (the EC Merger Regulation).

standard for blocking mergers “which would significantly impede effective competition, ...in particular as a result of the creation or strengthening of a dominant position.”

International Collaboration

It is neither unusual nor inappropriate for the United States and Europe to review mergers of foreign companies that affect commerce within their own borders. The location of merger consequences is relevant, not the nationality of the parties.

U.S. and European authorities have a long history of cooperation on antitrust review issues, primarily on the basis of the 1991 U.S.–EU bilateral cooperation agreement. This agreement calls for the two authorities to notify each other of cases that may be of mutual interest, as well as for coordination of enforcement activities and exchange of non-confidential information. The agreement is intended to avoid unnecessary conflicts between U.S. and European authorities. This cooperation was strengthened in 2002 with agreement on a set of Best Practices on Cooperation in Merger Investigations that require approval on both sides of the Atlantic.

Competitiveness Impact

Unfortunately, some of the rare conflicts that were not avoided between U.S. and European antitrust authorities concerned mergers between leading U.S. aerospace companies. Under these reviews, EU regulatory authorities attached far more conditions to its approval of the transactions than did U.S. authorities, raising concerns among some parties that the European Union might be protecting its industry and national champions from stronger U.S. competitors.

Case Sample: Boeing and McDonnell Douglas

One of those cases involved the merger of the two U.S. large civil aircraft manufacturers—Boeing and McDonnell Douglas. In July 1997, the U.S. Federal Trade Commission (FTC) announced it would not challenge Boeing’s acquisition of McDonnell Douglas (MD). After interviewing 40 airlines, the FTC concluded that McDonnell Douglas no longer constituted a meaningful competitive force in the commercial aircraft market.

European antitrust authorities shared the assessment that McDonnell Douglas was no longer competitive, but initially opposed the acquisition due to concerns that the merged entity would have a dominant position in world markets and thereby would harm Airbus’s competitive position. According to its Statement of Objections in May 1997, the EC believed the merger would lessen competition by combining Boeing’s long term exclusive airline sales contracts with McDonnell Douglas’s maintenance contracts, and in addition would enable Boeing to improve its commercial operations through McDonnell Douglas’s defense research and development contracts.

The United States sought and obtained consultations with the EU over this matter, and those consultations led to the EU modifying its objections sufficiently to allow the merger to proceed.

European Commission approval of the acquisition in October 1997 was granted after Boeing agreed to a number of conditions. Among other things, Boeing agreed to:

- 1) not enforce exclusive sales agreements Boeing had with three U.S. airlines; and
- 2) provide to the EC annually for 10 years detailed information on U.S. government aeronautical R&D contracts.

In fact, Boeing's share of the global market for new large civil aircraft deliveries has declined since the merger.

Case Sample: General Electric and Honeywell

In May 2001, the Department of Justice agreed to approve the General Electric Company's (GE's) acquisition of Honeywell contingent upon two conditions: Honeywell would sell its helicopter engine business and would license a new competitor to maintain and repair certain Honeywell engines. GE and Honeywell agreed to these conditions.

The EC was concerned that the "bundling" of GE aircraft engines with Honeywell's avionics would allow it to offer packages of components that its competitors could not replicate, which might ultimately result in weaker competitors and less vigorous competition. The EC also was concerned that GE's aircraft leasing arm, GE Commercial Aviation Service (GECAS), would tip the market decisively toward Honeywell products post-merger by purchasing only aircraft outfitted with Honeywell's avionics and other systems. GE was unable to resolve the EC's antitrust concerns and withdrew its offer to acquire Honeywell.

Where U.S. merger policy places confidence in the ability of established and emerging competitors to respond to a changing marketplace, the EU had less faith in the market response of competitors. In the GE-Honeywell case, the Department of Justice believed components likely would help consumers even if they harmed competitors of the newly-merged firm. In the long run, competitors (e.g., Pratt & Whitney, Rolls-Royce, SNECMA, and Thales) likely would develop effective counter-strategies if packages of equipment became important in the marketplace, such as teaming to develop their own packages. The Department also doubted that there was a plausible scenario whereby GECAS would tip the market decisively toward Honeywell products in some anticompetitive way. Among other reasons, this seemed unlikely due to GE's small share (roughly 10 percent) of large commercial aircraft purchases. The Department believed that the EU had not articulated a clear theory of harm relating to GECAS, aside from general fears about Honeywell's access to GE's "deep pockets" facilitating various anticompetitive practices post-merger.

Merger Reviews May Not Constitute a Trade Issue

There likely will continue to be at least some differences between U.S. and European antitrust authorities on merger reviews in the future based on different considerations of market dominance and consumer welfare. However, little evidence exists of a broad, concerted strategy by the EC to authorize mergers (or prohibit others) in order to create or protect European "national champions" in order to advance European trade interests.

Then-FTC Chairman Timothy J. Muris stated that he did not believe the different results in the GE-Honeywell reviews were due to European discrimination against U.S. firms or the application of industrial policy. Citing the fact that, as of 2001, only two mergers involving a U.S. firm had been prohibited by the EC (GE/Honeywell and MCI/Sprint), in spite of the 402 such merger cases reviewed, Mr. Muris said that cases like General Electric and Honeywell “are likely to be the exception and not the norm.”²³¹

Recent changes in European laws and policies and continuing collaboration with U.S. authorities may lessen those differences in the future. The U.S. and EU are improving cooperation on merger reviews and attempting to narrow remaining areas of difference through the bilateral contacts and the International Competition Network. In a June 7, 2004, speech on transatlantic antitrust issues, Department of Justice Assistant Attorney General R. Hewitt Pate highlighted positive movement in a number of areas of convergence of U.S. and European reviews.²³²

Nonetheless, increasing globalization of the aerospace industry, consolidation (sometimes across national boundaries), and a growing focus on partnerships and systems integration are likely to lead to future mergers between aerospace companies that undoubtedly will be carefully scrutinized by authorities on both sides of the Atlantic. There must be a high degree of confidence that any differences over future antitrust reviews are not the result of attempts to protect market share or national champions. Merger policies need to reflect changing market dynamics.

Press reports from May 2004 indicate that General Electric and Honeywell are challenging the European Commission’s 2001 decision to block their merger, citing mislaid evidence and failure of the EC to prove the merger would harm competition.²³³ Their goal reportedly is not to resurrect their merger proposal but instead to challenge the EC’s theory of dominance and conglomerate harm as applied to their aborted merger. This challenge will be important for U.S. companies that may seek to merge or acquire other companies in the future. The precedent presumably will be equally important for European aerospace companies that continue to consolidate, sometimes at the direction of their government shareholders.

10.d. Taxation

Aviation and non-aviation taxes and fees are significant factors affecting the global aircraft manufacturing sector. Aviation taxes levied on passengers such as the passenger ticket tax, flight segment fee, and international arrival and departure tax increase airfares, influencing the demand for air travel and thereby affecting sales by U.S. as well as European manufacturers. Airport and

²³¹ “Merger Enforcement in a World of Multiple Arbiters,” Timothy J. Muris, Chairman, Federal Trade Commission, December 21, 2001.

²³² Antitrust in a Transatlantic Context Conference, address by R. H. Pate, U.S. Department of Justice, Brussels, Belgium, June 7, 2004.

²³³ “Honeywell Appeal of Merger Veto Should Be Thrown Out, EU Argues,” *Bloomberg News*, May 25, 2004; “GE Says New Evidence Requires Reversal on Honeywell,” *Reuters News*, May 27, 2004; “Honeywell says European Panel Erred in Barring Merger with GE,” *The Record*, May 27, 2004.

air navigation services charges such as passenger facility charges and enroute and oceanic overflight fees also directly and indirectly impact passenger demand. Airlines are also affected by taxes on jet fuel, although the method and level of fuel taxation differs significantly in the United States and Europe.

Non-aviation-specific taxes directly affect aircraft manufacturers as well as operators. Like other businesses, aircraft manufacturing is taxed on income and sales. Policies related to such taxes on aircraft sold to international customers have a particular impact on aircraft manufacturers, given the significant percentage of aircraft exported each year. Numerous federal, state, and local taxes ranging from the alternative minimum tax to depreciation schedules and international provisions of the Internal Revenue Code affect the manufacturing industry.²³⁴ U.S. and European aircraft manufacturers receive tax exemptions for certain research and development expenses, as well as local tax incentives associated with manufacturing facilities. Freight and mail are taxed in both the United States and the European Union. U.S. airlines pay property tax on aircraft in 30 states. Property tax rates paid on aircraft owned by European airlines are unclear.

National Authorities

The amount of aviation-specific taxes and fees paid by carriers in the United States is variable based on factors such as number of passengers carried, the type of services provided, the carrier type, the total amount of airfare, and trip length. The U.S. government imposes or approves approximately 15 aviation-specific taxes and fees (Chart 23). According to a Massachusetts Institute of Technology study, taxes made up 15.5 percent of a \$335 total ticket price in 2002.²³⁵ An Air Transport Association (ATA) analysis of a nonstop \$100 round trip fare in the same year yields a higher accumulated tax of closer to 25.6 percent.²³⁶ This percentage includes the passenger ticket tax, flight segment fee, security fee, and the maximum Passenger Facility Charge for that illustrative trip. The tax/fee share of a fare decreases as the fare increases, accounting for some of the disparity of these calculations.

²³⁴ *Manufacturing in America: A Comprehensive Strategy to Address the Challenges to U.S. Manufacturers*, U.S. Department of Commerce, January 2004.

²³⁵ *Aviation Taxes and Fees* (GAO-04-406R). General Accounting Office, March 2004, page 7.

²³⁶ "Ticket Tax Illustration," *Air Transport Association*, 2004. www.airlines.org/econ..

Chart 23: U.S. (or U.S.-approved) Aviation Excise Taxes and User Fees Special Taxes and Fees Levied on Commercial Aviation		
Effective January 1, 2005	RATE	UNIT OF TAXATION
PASSENGERS		
Federal Ticket Tax	7.5%	Domestic Airfare
Federal Flight Segment Tax	\$3.20	Domestic Enplanement
Federal Security Surcharge	\$2.50	Enplanement at U.S. Airport
Airport Passenger Facility Charge	Up to \$4.50	Enplanement at Eligible U.S. Airport
International Departure Tax	\$14.10	International Passenger Departure
International Arrival Tax	\$14.10	International Passenger Arrival
INS User Fee	\$7.00	International Passenger Arrival
Customs User Fee	\$5.00	International Passenger Arrival
APHIS Passenger Fee	\$4.95	International Passenger Arrival
SHIPPERS		
Cargo Waybill Tax	6.25%	Waybill for Domestic Freight
SALES/OPERATIONS		
Frequent Flyer Tax	7.5%	Sale of Frequent Flyer Miles
APHIS Aircraft Fee	\$70.00	International Aircraft Arrival
Jet Fuel Tax	4.3¢	Domestic Gallon
LUST Fuel Tax	0.1¢	Domestic Gallon
Air Carrier Security Fee	Carrier-Confidential	CY2000 Screening Costs

Source: Air Transport Association. <http://www.airlines.org/econ/print.aspx?nid=4919>

The current U.S. aviation excise tax structure is levied on passengers, aviation fuel for domestic flights, and freight. The domestic passenger ticket tax is an ad valorem tax of 7.5 percent. Domestic flight segment fees are \$3.20 per segment. An additional tax of 7.5 percent is charged for domestic enplanements and deplanements in Alaska and Hawaii, applicable to the portion of the fare that relates to miles flown within the United States. International arrivals and departures are taxed at \$14.10 per passenger. The general aviation fuel tax is \$0.193/gallon for aviation gasoline and \$0.218/gallon for jet fuel. Freight and mail shipments are taxed at 6.25 percent of waybill shipment charges. Airlines pay a \$0.043/gallon sales tax on jet fuel for flights within the United States.²³⁷

Some taxes and fees relate to airports and air navigation services. The passenger facility charge is a local airport charge, approved by the FAA, and varies by airport, ranging from zero to \$4.50. The United States charges overflight fees for aircraft traveling through U.S. airspace. For

²³⁷ There are two aviation fuel taxes in the United States—one for general aviation and one for commercial aviation. However, international flights are exempt from fuel taxes based on bilateral agreements.

example, the U.S. enroute overflight fee for a Boeing 747-400 is equal to \$33.72. Similarly, the U.S. oceanic overflight fee for a Boeing 747-400 is \$15.94.²³⁸

The revenue collected through these taxes and fees is significant. In FY2002, collections of these taxes and fees totaled nearly \$12.6 billion.²³⁹ Much of that revenue is used to support various aspects of the civil aviation system, such as to finance aviation infrastructure improvements and maintenance (e.g. airports, air traffic control) or services provided to the industry (e.g. security inspections, customs inspections). Trust fund collections (ticket tax, fuel tax, etc.) covered over 90 percent of the FAA's \$13.5 billion budget authority in FY2002.

Non-aviation-related taxes directly affect aircraft manufacturers. The largest of these is the U.S. corporate income tax rate of 35 percent. In practice, U.S. manufacturers usually pay a lower effective corporate tax rate due to various tax credits and federal tax incentives such as those related to asset depreciation and research and development credits. For example, Internal Revenue Service rules permit companies to write off the value of aerospace manufacturing equipment investments over a period of seven years, comparable with depreciation schedules for other major manufacturing-related capital expenditures. Manufacturers are able to write off other capital investments such as computers and electronics over three to five years, depending upon the product. Although there is general parity across manufacturing sectors, depreciation schedules have not been updated for decades and may not accurately reflect changes in the productive life of manufacturing technologies and investment practices over that time. State and local tax regimes vary widely across the United States based on many factors.

The U.S. corporate tax burden also has in the past been reduced through special tax rules related to certain products manufactured in the United States but sold in international markets. These rules were developed to eliminate competitive distortions resulting from differences between U.S. and foreign tax regimes. The United States employs a predominately "worldwide" tax system that taxes U.S. companies on all of their income, whether earned at home or abroad. Some other countries use a predominately "territorial" system, taxing only income earned domestically, such as a value added tax (VAT).²⁴⁰ The territorial tax system has a tendency to result in income from the sale of exports being taxed more favorably than income from comparable domestic transactions.

The United States sought to address this difference through the creation initially of the Domestic International Sales Corporation rules, and subsequently through the Foreign Sales Corporation (FSC) tax code provisions. These provisions essentially allowed U.S. firms to defer or exempt

²³⁸ FAA charges overflight fees (enroute, oceanic) for aircraft that fly through U.S.-controlled airspace but neither take off nor land in the United States. They are based on great circle distance, calculated as the shortest distance between two points on a sphere. Estimates are based on 100 nautical miles. Overflight fee revenues in the United States go to a special account that funds the Essential Air Service program.

²³⁹ *Aviation Taxes and Fees* (GAO-04-406R), General Accounting Office, March 2004.

²⁴⁰ Value added tax (VAT) is a general tax that applies to commercial activities involving the production and distribution of goods and the provision of services. It is a consumption tax because it is borne ultimately by the final consumer; it is not a charge on companies. The tax is calculated as a percentage of price at each stage in the production and distribution chain and is collected fractionally, via a system of deductions whereby taxable persons (i.e. VAT-registered businesses) can deduct from their VAT liability the amount of tax they have paid to other taxable persons on purchases for their business activities.

from taxation a percentage of their export income. Following a challenge of the FSC provisions by the EU before the World Trade Organization (WTO), the United States replaced the FSC provisions with the Extraterritorial Income (ETI) Exclusion provisions in November 2000 to comply with the WTO ruling. Following the European Union's successful challenge of the ETI before the WTO, the ETI provisions were repealed in the American Jobs Creation Act of 2004 (AJCA). U.S. aerospace manufacturers with export sales made use of FSC and subsequent ETI provisions to give them a more even footing in competitions with foreign companies from countries with territorial tax regimes. The AJCA also created a new tax deduction for domestic production activities under section 199. U.S. aerospace manufacturers probably will benefit from the new tax provisions under section 199. However, the extent to which they will be affected remains to be seen.

The European Union has not yet developed any standard aviation-specific taxes. Taxation still is the domain of individual EU member states that impose their own passenger ticket taxes. Categories of European government taxes and fees are similar to those in the United States, but amounts charged and the use of revenues collected varies widely among EU member states.

Aviation-specific taxes and fees most commonly imposed in Europe include an airport tax (passenger service charge) that varies by airport, a security charge, and a VAT. The European VAT rates on airline tickets for the most part are higher than the U.S. ad valorem tax (Germany's VAT is more than twice as much). An illustrative comparison of taxes and fees (excluding fuel) for a sample trip (\$200 round-trip, nonstop domestic) revealed that the overall aviation-specific tax rate in the United States is lower than the total tax rate in France, Germany, Italy or the United Kingdom.²⁴¹

EU member states impose general taxes on fuel used for all modes of transport; none is specific to civil aviation. The European Commission does not currently impose a tax specific to aviation fuel but is considering one. Revenues from aviation fuel taxes go to the national general funds. For example, there is a general gas tax rate of 0.286 euros per liter in France.

European overflight (or enroute) fees are significantly higher than those in the United States. Enroute fees for a B-747-400 equaled \$370.34 for France, \$458.76 for Great Britain, and \$550.90 for Germany when the last comparison was completed.²⁴² Depending on the country, enroute fees in Europe can go to national or specific transportation funds.

European corporate income tax base rates vary slightly among EU member states but are roughly on par with the U.S. base tax rate.²⁴³ As in the United States, the effective corporate income tax

²⁴¹ U.S. Department of Commerce Office of Aerospace and Automotive Industries estimates based on European tax and fee data provided by the International Air Transport Association.

²⁴² *Illustrative Comparison of Charges for Selected Aircraft Types*, FAA, June 2003.

²⁴³ In Great Britain the income tax rate is 30 percent and in Spain it is 35 percent. In France, the corporate tax rate for 2003 and 2002 was 33 1/3 percent plus surcharges of 3 percent (contribution permanente) for 2003 and 3.3 percent (contribution permanente) for 2002. In Germany, the Flutopfersolidaritätsgesetz was enacted in September 2002, leading to a 1.5 percent increase of federal corporate tax for the fiscal year 2003. Accordingly, with the group's German subsidiaries, income taxes in aggregate were 40 percent in 2003.

rate usually is lower than the statutory rate due to tax incentives such as accelerated depreciation for fixed assets and R&D infrastructure. Furthermore, France, Spain, and the Netherlands provide credits for research expenditures, deferral of tax for foreign subsidiaries, exemptions from business tax for depressed areas, and tax holidays in enterprise zones.²⁴⁴ Due to its complicated corporate and ownership structure, the overall effective tax rate actually paid by the European Aeronautic, Defense, and Space Company (EADS), parent company of Airbus, and its member companies is difficult to determine. EADS is legally seated in the Netherlands, which has a corporate income tax rate of about 35 percent. However, companies incorporated in the Netherlands but without production facilities there often are able to negotiate a 10 percent corporate tax rate on all income claimed by that corporation. Foreign subsidiaries of Airbus reportedly apply national corporate tax rates on domestic income (i.e. EADS facilities in Germany would pay German corporate tax on income earned in Germany), but the amount of income claimed in each country is unclear.

European countries employ a territorial VAT system described previously. EU legislation mandates that the minimum standard VAT rate set by EU member states must be 15 percent, which will be in effect at least until December 31, 2005. Current VAT standard rates are 17.5 percent in the United Kingdom, 19.6 percent in France, and 16 percent in Germany and Spain. Non-EU companies that export to the European Union are taxed when the product crosses the border. Goods that are exported from the European Union are zero-rated and not subject to the VAT. As a result, European aerospace manufacturers enjoy a competitive advantage on their exports in comparison to U.S. exporters.

Competitiveness Impact

Domestic tax policies related to the international sale of aerospace products have the greatest direct impact on the U.S. aerospace manufacturing industry, especially given that a significant majority of aircraft, engines and parts are sold to international customers. In fact, Boeing attributes a portion of its declining share of the European market (down 50 percent to 13 percent over the past five years) to the differences in U.S. and European tax regimes.²⁴⁵

The impact of the resolution of the transatlantic FSC/ETI dispute on U.S. aerospace companies is unclear. What is certain is that any resolution will impact U.S. aerospace companies that have in the past made use of these tax provisions. If the AJCA results in a higher relative income tax burden for U.S. aerospace manufacturers, their European competitors will enjoy a distinct advantage in international sales competitions.

Corporate income tax rates affect the relative competitiveness of U.S. and European manufacturers, although a direct comparison of effective tax rates for this study was not possible. The wide variety of U.S. and European federal, state, and local taxes policies such as R&D tax rebates, depreciation schedules, or investment credits makes an assessment of the overall impact of these direct taxes difficult to conduct. Aerospace manufacturers in both regions benefit from these types of policies. U.S. depreciation schedules for aerospace manufacturing capital

²⁴⁴ *Competitive Assessment of the U.S. Large Civil Aircraft Aerostructures Industry*, International Trade Commission, Publication 3433, June 2001.

²⁴⁵ Interviews with Boeing employees by the Federal Aviation Administration.

investments are relatively outdated, albeit comparable to depreciation schedules for other industrial sectors. It is unclear what depreciation schedules apply to capital investments by European aerospace manufacturers or how they compare to depreciation schedules for other capital-intensive industries.

Because they impact the aircraft owners and operators (and not directly the manufacturers), aviation-specific taxes and fees do not have much effect on the competitive standing of U.S. vs. European manufacturers in global markets. However, they do affect the ability of airlines to purchase and operate aircraft from any manufacturer. There has been much debate within the government and with the U.S. aerospace and aviation industry on the need for tax policy and aviation fee reform. For example, the Air Transport Association has lobbied to have lower aviation taxes to assist air carriers in difficult post–September 11 times.

The full impact on ticket prices of modifications to operating costs, including aviation-related tax and fee structures, is somewhat difficult to assess. Independent research has shown that, in some instances, when the airlines received a tax holiday on security fees, overall ticket prices were not lowered.²⁴⁶ At the same time, in 2004 a number of airlines sought to partially offset rising fuel costs by increasing passenger ticket prices in some markets. In almost every case the fuel surcharge was withdrawn after competitor airlines declined to follow suit. Reduced taxes and fees certainly would reduce costs to aviation service providers and passengers, thereby providing at least some indirect benefit to U.S. aerospace manufacturers.

²⁴⁶ *Aviation Taxes and Fees* (GAO-04-406R), General Accounting Office, March 2004, page 9.

Chapter 11 – Implications for Manufacturing Competitiveness

11.a. Near-term Evolution

Passenger Airlines

Structural changes in the global airline industry are changing the nature of competition among manufacturers. Low-cost carriers (LCCs) are placing large orders of new aircraft, usually of a single type, in order to meet aggressive growth targets and based on solid financial footing. Three LCCs (ATA, Southwest, and Ryanair) collectively accounted for about 37 percent of all Boeing 737 orders in 2003. This was roughly equal to the number of 737 orders collectively placed by the remaining 22 airlines in the same year (excluding the largest single 737 order for the year by Japanese carrier ANA). Two LCCs (JetBlue Airways and Frontier) accounted for half of the Airbus A320 family order book in the same year.²⁴⁷

To date, most LCCs have not introduced RJs into their fleets, in part due to their higher operating costs. That dynamic may change, depending in part upon the experience of Independence Air, which recently transformed from a feeder airline for legacy carriers and started its own operations with a fleet of RJs. However, AirTran CEO Joe Leonard recently stated that for AirTran's operations, although a Boeing 717 has slightly higher total plane-trip costs than an RJ from Embraer or Bombardier, the operating cost per seat mile on the 717 is about half that of an RJ.²⁴⁸

It is unclear what the current transformation of the airline industry will mean for future procurements. Use of RJs may be an attempt by some legacy carriers to salvage the old business plan that clearly is in jeopardy due to the collapse of high-end demand. It may make sense in the short term because the legacy carrier's cost structures simply do not allow them to profitably operate the larger aircraft in many markets where they have been used in the past.

Most business travelers continue to use legacy carrier services, although the prices they pay generally have declined since 2000. LCCs are capturing an increasing share of business travel due to factors such as product improvement and network expansion. However, certain high-margin business travelers may be permanently shifting to other modes of service such as privately operated aircraft due to improved flexibility of operations and increasing affordability of long-range business jets. Fractional ownership programs, where companies can buy a set amount of service provided via a pool of business jets, are making private aircraft a much more affordable option than they have been in the past.

Although some of these trends are being established by U.S.-based airlines, they are being replicated in many other regions of the world. European and Asian LCCs are growing in market share and influence, using the same business models as their U.S. counterparts.

²⁴⁷ DOC/Office of Aerospace analysis of company order statistics.

²⁴⁸ "AirTran Buys Some Extra Range with 737, but the Switch Could Hurt the 717 Program," *Seattle Post-Intelligencer*, June 9, 2004.

Threat of Bankruptcy

The recent Chapter 11 filings by U.S. airlines and the accompanying cloud of uncertainty hanging over the passenger airline industry have affected each manufacturer differently. In September 2004, Embraer had temporarily suspended deliveries of aircraft to U.S. Airways due to the carrier's second Chapter 11 bankruptcy filing. The airline owes Embraer \$1.47 billion for future aircraft commitments. This did not immediately impact Embraer's staffing or production levels. Furthermore, Embraer's stock prices actually rose for two days after the U.S. Airways filing.²⁴⁹ However, the long-term impact may be a different story.

Conversely, the second Chapter 11 filing by U.S. Airways appears to have had a much more negative impact on rival aircraft manufacturer Bombardier. At the time of the filing, U.S. Airways had 45 aircraft on order with Bombardier. As a result, Standard & Poor placed Bombardier and its subsidiaries on credit watch with negative implications, citing "the continuing deterioration in the U.S. airline sector that could further impair Bombardier's ability to restore its profitability." Further complicating matters for Bombardier is the uncertainty surrounding Delta Airlines, with 42 Bombardier aircraft on order, as it struggles to avoid bankruptcy.²⁵⁰

When they filed for Chapter 11 bankruptcy protection in 2002, United Airlines was a major Boeing customer. At the time, Boeing Capital had an exposure of about \$1.3 billion to United. However, with most of that exposure secured by Boeing 777 aircraft, and due to the overall strong credit rating of Boeing, the United filing did not have much of an immediate impact on Boeing's financial position.²⁵¹

In contrast to the Chapter 11 scenarios, a Chapter 7 liquidation filing by a major U.S. carrier would have a serious impact on both the regional aircraft manufacturers and the large civil aircraft manufacturers. The impact of each manufacturer would depend on the carrier and the composition of their respective fleet. Generally speaking, liquidation would cause an increase in the amount of aircraft available in the secondary market, therefore hurting the sales of new aircraft. This would also negatively impact the residual values of new and used aircraft. It also could have a significant impact on the financiers and lessors of the aircraft operated by the liquidated airline.

The European passenger airline industry also is undergoing structural changes. Several European governments are reviewing plans to relinquish their ownership stake in national carriers. European legacy airlines are reviewing options to rationalize fleets and routes throughout Europe to meet the challenge of LCCs. Cost pressures such as rising fuel prices are causing European airlines to reevaluate their operations in the same manner as their U.S. counterparts. Competition in international routes from restructured U.S. airlines may spur these changes. Although less likely than their U.S. counterparts to enter into bankruptcy, European

²⁴⁹ "Update 2 – Brazil Embraer puts US Airways Deliveries on Hold," Reuters, September 15, 2004.

²⁵⁰ Canadian Press Newswire, September 13, 2004.

²⁵¹ AFX News Limited, December 9, 2002.

airlines, in rationalizing fleets and routes, could provide an additional source of newer used aircraft that would compete with new aircraft sales.

Air Cargo

Air cargo operations have increased significantly over the last 20 years, primarily for the transport of high-value or time-critical products. Operators are a mix of traditional passenger carriers and cargo-only operators. Cargo-only airlines are financially more stable than passenger airlines, and even have begun buying new aircraft to meet specific capacity and operational needs. The cargo carrier market already utilizes a high volume of converted used passenger aircraft, and it is possible that a Chapter 7 filing by a passenger airline could lead to fewer new aircraft purchased by cargo airlines as less expensive used aircraft become available.

Evolution of Aerospace Manufacturing

Aerospace manufacturing is expected to continue the trends of increased focus on systems integration and global partnerships. U.S. firms appear well positioned to maintain a significant presence in global markets. However, aerospace manufacturers in other countries will continue to build expertise and market share, likely at the expense of U.S. producers that previously dominated global markets. To the extent that foreign governments plan to support their manufacturers, competition at all levels likely will become increasingly fierce. U.S. suppliers will continue to seek increasing participation in foreign aircraft manufacturing programs as those programs grow their global market share.

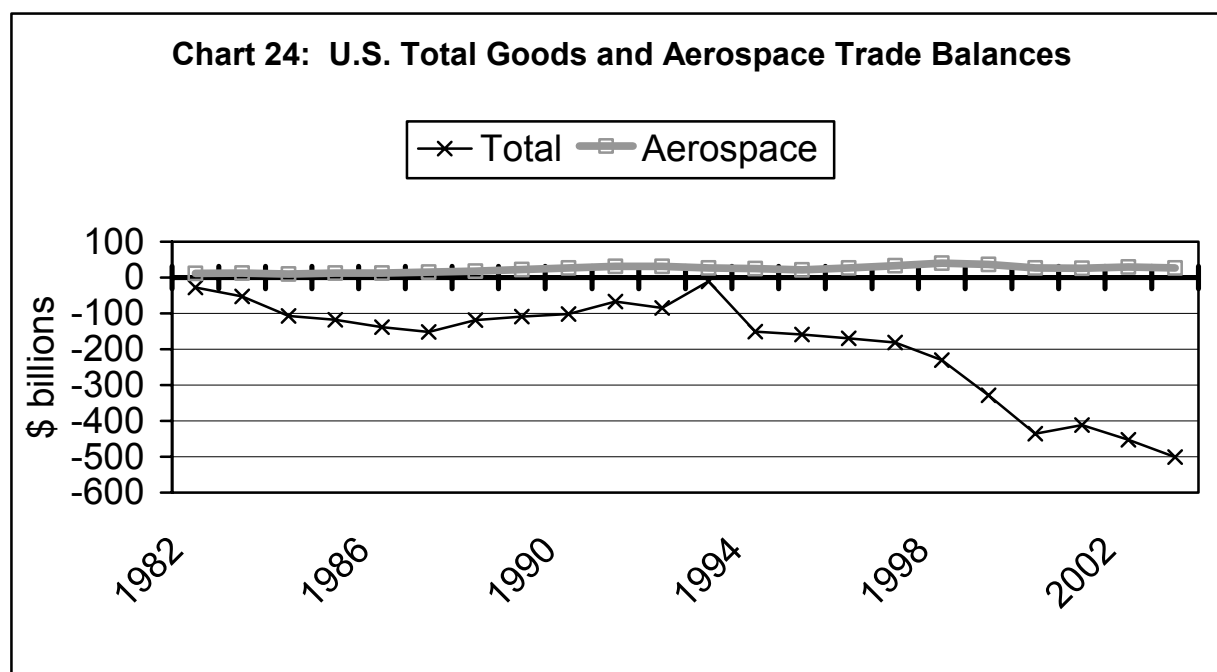
Aerospace manufacturers will continue to place a high priority on efficiency—both in terms of aircraft development and production—as well as seek to provide the best value to their customers. U.S. and European manufacturers will continue to look for risk-sharing partners for development of new products. Boeing and Airbus have announced goals of cutting supplier costs by as much as 20 to 30 percent in an effort to remain competitive.²⁵² U.S. manufacturers may be more aggressive than their European counterparts in seeking internal cost savings, as evidenced by Boeing's recent plans to sell its major facility in Wichita and its requirements for Boeing operating units to compete against other suppliers for participation in the new 787 program.

Within the LCA and engine markets, there essentially are two broad marketing strategies at play: loss leader vs. superior product efficiency. Companies deploying the loss leader theory are willing to take losses on sales to gain market share with the expectation of future business for spare parts, repairs, and even new sales. Other companies may demand higher prices for aircraft or engine purchases on the grounds that superior operating efficiencies actually make the products cheaper throughout the life cycle of the product. Although discounts from published prices are widely accepted as the norm in the aerospace industry, actual sales prices and supplier contracts are not public information.

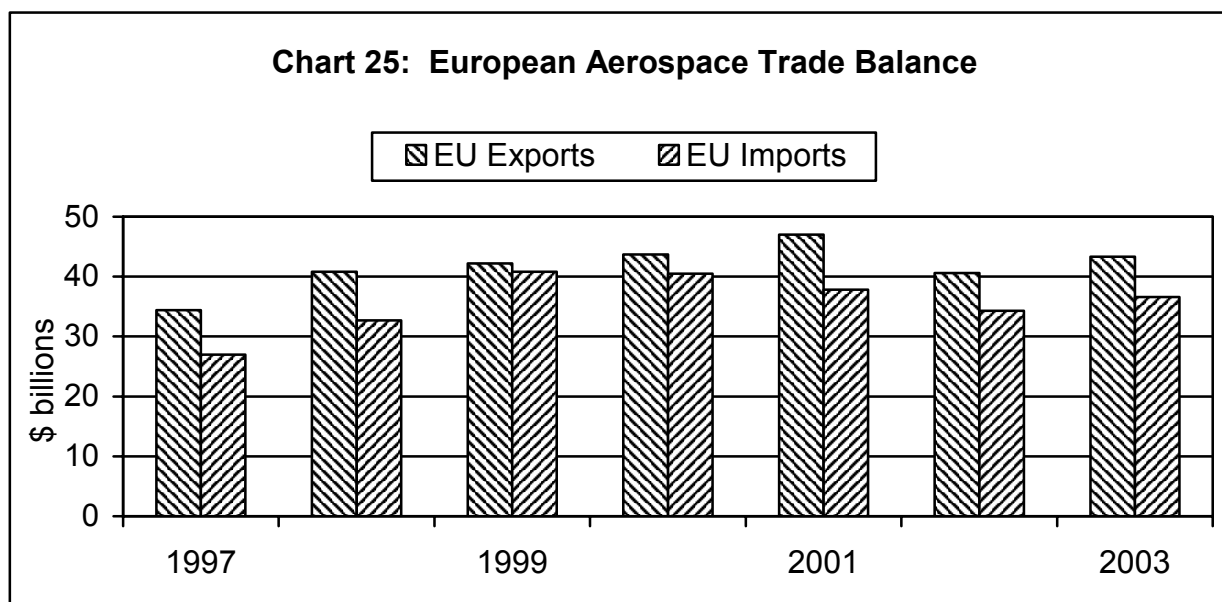
²⁵² “Boeing Exec Says Costs Must Be Cut More Deeply,” *Seattle Post-Intelligencer*, July 25, 2002; “Airbus Cuts Will Guard Against Weak Dollar,” *Financial Times*, February 27, 2003.

Nonetheless, Boeing repeatedly has asserted that maintaining profit margins is more important than market share and that none of Boeing's sales should be loss leaders.²⁵³ Airbus counters that it can offer lower prices because of greater manufacturing efficiencies, but actual production and sales costs are difficult to determine from Airbus financial statements. Given the cutthroat competition in today's airline industry, manufacturers striving to convince airlines that they can provide best value are likely to focus in particular on near-term cost savings. Efficiency and cost savings were central themes in Boeing's marketing campaign for its new 787, which is advertised to yield a 20 percent cost savings over aircraft models of comparable range and size.

U.S. and European aerospace manufacturers will continue to rely heavily on global markets for sales. The U.S. aerospace industry has enjoyed a trade surplus for decades, maintaining a steady level of approximately \$25 billion to \$30 billion since 1990. The significance of this trade surplus is evident when compared to the overall U.S. trade in goods deficit (Chart 24). European aerospace manufacturers enjoy a similar, albeit smaller, trade surplus as well (Chart 25).

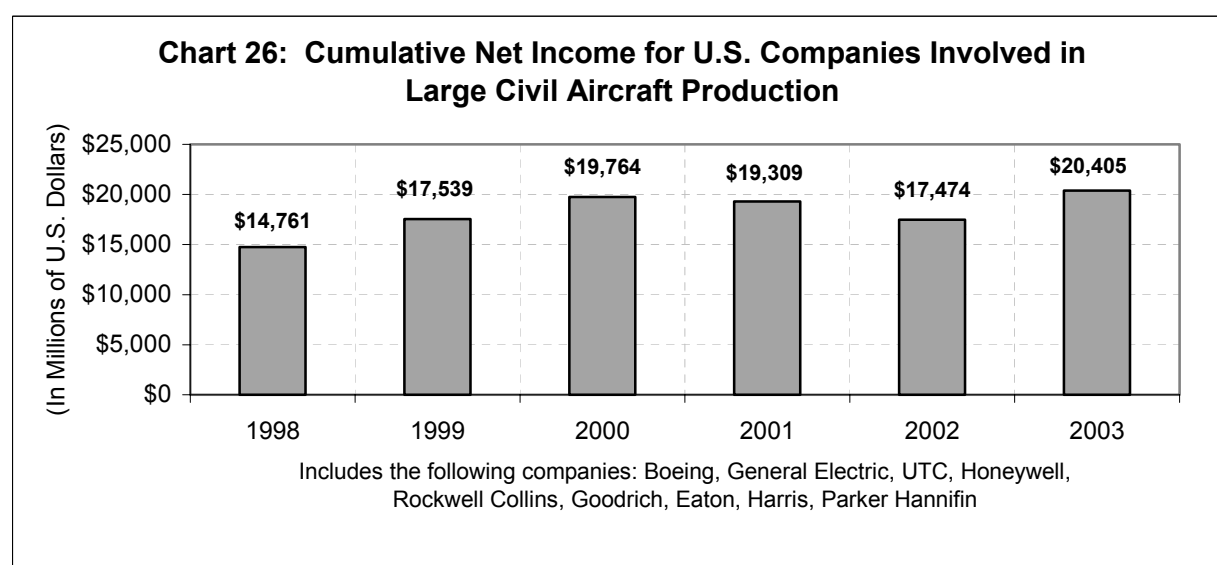


²⁵³ "Boeing To 'Raise the Rhetoric' in Subsidy Row with Airbus," *Times Newspapers Limited*, May 20, 2004; "Sky Wars: The Plane Truth is Airbus and Boeing Are Battling for Control of Commercial Aviation," *Industry Week*, March 2005.



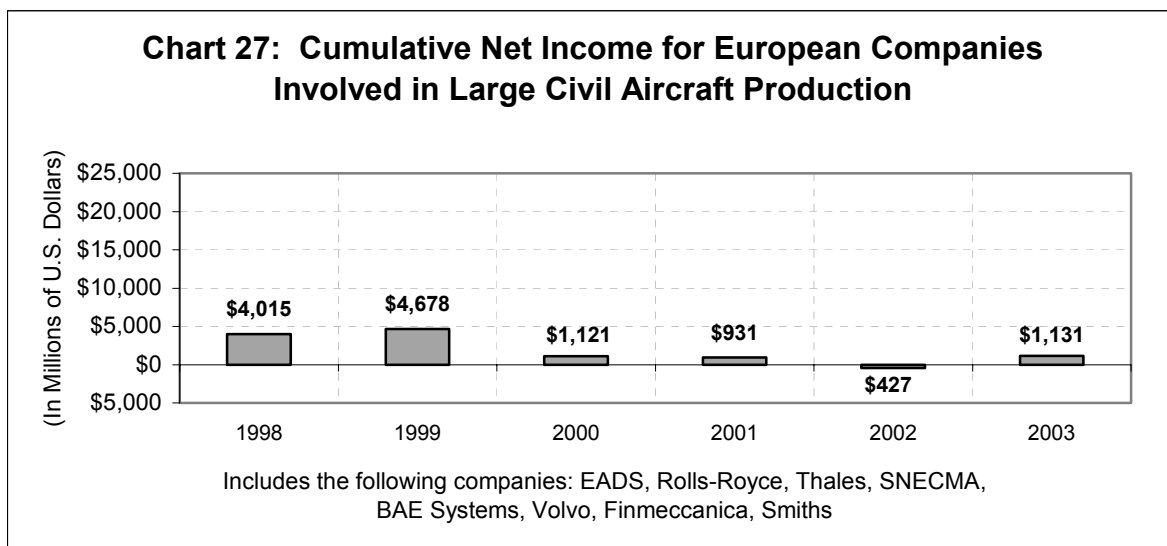
Source: U.S. Department of Commerce

Overall, the U.S. companies that are primarily or significantly involved in the production of large civil aircraft are remarkably sound. One logical explanation for this financial stability is that these companies are diversified in other sectors of aerospace, such as defense, as well as in other unrelated industries. As indicated previously (Section 5.a.), the U.S. manufacturers reviewed in this study generally have outperformed the S&P 500, and eight of the nine publicly traded companies are rated as investment grade by the major credit rating agencies—meaning that these companies are sound enough to attract institutional investors because of low risk, thereby reducing their overall cost of capital. As evidenced below in Chart 26, the ten U.S. aerospace companies reviewed have together shown robust quarterly net income, further demonstrating that the U.S. large commercial aircraft market has a strong corporate base of support.



Source: Bloomberg Professional

On the surface, the European industry looks very similar to the U.S. industry in the number of companies involved in LCA production. However, European companies tend to be involved only in aerospace. While there is a differentiation between civil and military segments, the European companies just do not have the same level of corporate diversification as the U.S. industry. Of the 10 European companies that were analyzed for this report, two companies are significantly government-owned, one company has been recently restructured due to solvency issues, one company has a Bloomberg financial health grade of “F”, and other companies have either limited or inconsistent financial information available. The major European manufacturers have not enjoyed the same growth in cumulative net income over the last six years as their U.S. counterparts. In fact, cumulative net income for eight of these companies declined from 1999 to 2002 to a low of -\$427 million, further evidence of the weaker financial position of the overall European industry²⁵⁴ (Chart 27).



Source: Bloomberg Professional

11.b. Anticipated Changes in Regulations and Policies

Aerospace Manufacturing

European privatization

Some European governments (France in particular) are considering reducing the level of government ownership in European aerospace manufacturers. The government of France partially privatized engine manufacturer SNECMA in June 2004, reducing its ownership to 62

²⁵⁴ Although International Aero Engines (IAE) is technically a European company because it is listed in Zurich, Switzerland, IAE net income is not included due to the broad geographical dispersion of IAE member companies. MTU net income is not included due to difficulty in identifying the portion of relevant net income of MTU's parent company Kohlberg Kravis Roberts & Company, which should be allocated to MTU production.

percent. In October 2004, the French government announced support for a further privatization of SNECMA through a merger with partially government owned French electronics manufacturer SAGEM, reportedly intended to create a new national champion in the defense and electronics sector. The French government also is supporting the possible merger between aircraft manufacturer EADS and French electronics company Thales.

In theory, reduced government ownership would increase the influence of private-sector shareholders and market-based factors over corporate operations. However, the real long term impact is difficult to predict. Both of these possible mergers appear to be driven by political motivations rather than market conditions. Industry analysts have raised concerns that the SNECMA-SAGEM merger would make little strategic sense for SAGEM. Thales executives have been reportedly calling a merger with EADS a “diplomatic disaster,” undermining its status as the United Kingdom’s second largest defense contractor.²⁵⁵ The German government has expressed concern that an EADS-Thales merger would upset the careful division of work share among EADS partners based on national boundaries. If European privatization leads to mergers that create more formidable global competitors that are less subject to competitive market forces, that is likely to have a negative impact on customers in the United States and elsewhere.

Policies and Regulations

The U.S. government is reviewing a number of aerospace-related international trade agreements and policies in an effort to bring them in line with changes in the global aerospace industry.

Financial Support

After years of unsuccessful effort to bring more discipline to European government financial support, and in light of continuing launch aid requests by Airbus, the United States resorted to abrogating the U.S.–EU Agreement on Trade in Large Civil Aircraft (1992 Agreement) on October 6, 2004. The United States also requested consultations with the European Commission and the governments of Germany, France, the United Kingdom, and Spain regarding subsidies inconsistent with obligations under the WTO Agreement on Subsidies and Countervailing Measures and the GATT 1994. Almost simultaneously, the European Commission requested separate consultations with the United States alleging actions by U.S. government entities inconsistent with the same WTO obligations.

Brazil/Canada as an Example: Another recent aircraft subsidies dispute brought to the WTO—between Brazil and Canada over subsidies to their respective regional aircraft producers—has not yet resolved either party’s concerns in spite of four years of negotiation and multiple rulings. On July 10, 1998, the government of Canada requested the formation of a WTO dispute settlement panel to examine Brazil’s Programa de Financiamento de Exportacoes (PROEX) program after two years of consultations had failed. Bombardier asserted that it faced a competitive disadvantage because PROEX directly reduced the cost of the Embraer ERJ-145 by \$2.45 million per aircraft. In 1999, Brazil’s PROEX program was ruled an illegal subsidy by the WTO, finding that between 1996 and 1999, Brazil had committed more than \$4.5 billion in

²⁵⁵ “Paris in Frantic Military Maneuvers”, *Financial Times*, November 11, 2004; “Anger over EADS Tie-up with Thales,” *Financial Times*, November 15, 2004.

PROEX aircraft subsidies. The WTO ruled that PROEX reduced the cost of Embraer aircraft to purchasers by “several millions of dollars.” Brazil did not remove the subsidies but has since modified the program so that it is possible that the program may be operated in a manner consistent with WTO obligations. When Brazil did not comply with the WTO ruling to Canada’s satisfaction, the WTO approved Canadian sanctions on Brazil worth \$255.6 million for multiple years. In 2001 the WTO ruled that Brazil’s modified PROEX III “is not inconsistent with the SCM Agreement.”²⁵⁶ It appears that this vaguely worded ruling means that the program is now in compliance with international obligations.

It is unclear what impact the WTO subsidies cases filed by the United States and the European Commission will have on the U.S. and European aerospace industries. Initial progress in resolving U.S. concerns has been slow. European officials initially appeared satisfied with the status quo and showed little interest in developing new subsidy disciplines. Progress was further delayed by a change in leadership of the European Commission.

On January 11, 2005, the United States and the European Commission announced the temporary suspension of their respective WTO proceedings to facilitate negotiation of a new U.S.-EU agreement on trade in large civil aircraft. The U.S. objective in these negotiations is to eliminate new subsidies for the development or production of large civil aircraft. If the bilateral negotiations fail, the dispute is likely to return to the WTO.

One of the key provisions of the 1992 Agreement, government intervention in sales campaigns, is not mentioned in either the U.S. or European WTO subsidies complaint. Nonetheless, political sales pressure continues to be of great concern to U.S. officials. General obligations related to this activity remain in the WTO Agreement on Trade in Civil Aircraft, and the United States hopes to build consensus among WTO ATCA members to strengthen these provisions. This also may be a subject of negotiation between the United States and Europe on any new bilateral aircraft trade agreement.

Export Financing

The U.S. government and other Organization for Economic Cooperation and Development (OECD) members are updating the aircraft-related sections of the Arrangement on Officially Supported Export Credits to take into account the changing global market for aircraft. Subjects of discussion include establishing a risk-based fee structure for aircraft financing as well as extending the repayment terms to more accurately reflect the long product life of commercial aircraft. The United States and other OECD members also have invited Brazil, not a member of the OECD, to participate as a full negotiating partner in the current review, and are seeking to extend these finance rules to government export credits for sale of regional jets. If successful, this will help to bring government-supported export financing for Brazilian as well as Canadian regional jets into line with export credit agencies (ECAs) support for larger commercial aircraft. These revisions will help to neutralize financing as a competitive factor in the selection of aircraft. The United States prefers for ECAs to serve as lenders of last resort and wants to

²⁵⁶ Second Recourse to Canada to Article 21.5 of the DSU, WTO, July 26, 2001.

minimize ECA competition with private-sector financiers, as well as make ECA financing more useful.

Bribery

Bribery remains a concern to U.S. aerospace companies. The U.S. government and the OECD Working Group on Bribery are continuing to follow up on obstacles to each party's implementation and enforcement. In addition, the U.S. government may, if circumstances warrant, continue to engage countries bilaterally to encourage progress to fully implement their obligations under the antibribery convention. With regard to the tax deductibility of bribes, the U.S. government will support efforts in the OECD to strengthen the 1996 OECD recommendation on the tax deductibility of bribes.

Political Parties/Candidates: When the antibribery convention was negotiated in 1997, the United States sought to include coverage of bribes paid to political parties, party officials, and candidates for public office. Those channels of bribery and corruption are covered by the FCPA; however, they are not specifically covered in the Antibribery convention. Although the U.S. government considers expanding the scope of the antibribery convention to include bribes to political parties and candidates to be particularly important, to date we have not persuaded other convention parties to support the inclusion. The U.S. government continues to believe that the issues of bribes to political parties and candidates related to possible coverage by the convention continue to merit attention, and will seek to achieve consensus among convention parties to ensure such coverage.

Export Credits: Recent press reports indicate that European aerospace companies—including Rolls-Royce, Airbus, and BAE Systems—are among the business groups pressing their governments to relax antibribery rules.²⁵⁷ A United Kingdom Export Credit Guarantee Department representative outlined to Members of Parliament a series of concessions that were sought to soften the impact of rules applicable to U.K. export credit. To the extent that bribery and anti-corruption disciplines and enforcement in Europe remain weaker than under the FCPA, European aerospace companies enjoy a competitive advantage in sales competitions to foreign governments or government-controlled airlines. The U.S. government will continue to look for opportunities to establish effective measures to address bribery in export credits. For example, requiring antibribery awareness and compliance programs as a condition to participate in export credit and other government-funded programs may be considered. In addition, seeking to increase transparency by firms related to their use of foreign agents to secure foreign contracts also may merit attention.

The U.S. government continues to push its anti-corruption agenda forward. For example, consistent with the bipartisan Trade Promotion Authority Act of 2002 (TPA), the U.S. government is seeking and obtaining binding commitments in free-trade agreements that promote transparency and that specifically address corruption of public officials.

²⁵⁷ "Bribery Rules Too Tough for Rolls, Airbus, and BAE," *The Guardian*, November 17, 2004.

Safety Certification

Establishment of the new European Aviation Safety Agency (EASA) is likely to reduce the cost and time necessary to receive European certification of new commercial aircraft and engine models introduced by U.S. and European companies. Progress toward establishment of EASA has been slower than initially planned, and the United States will continue to monitor new organization. The FAA is now negotiating with EASA to establish the legal framework governing their bilateral relations in an effort to transition existing safety and certification agreements between the FAA and EU member states to a single bilateral agreement with the EC. It will be important for these negotiations to mature sufficiently in time to avoid any delay in certification of new aircraft models such as the Airbus A380 or the Boeing 787.

Diverging trends in U.S. and European certification-related technical assistance to third countries could lead over time to a competitive disadvantage for U.S. companies. As noted in Chapter 8, the FAA is involved in a broad array of technical assistance programs through ICAO as well as bilaterally. However, budget and legal constraints have curtailed to some extent U.S. federal agency training of foreign aviation officials in the United States and abroad, compared to the increasing number of European-sponsored aviation training and technical assistance centers around the world. While the purpose of such activities is to enhance the safety and operation of the global aviation system, such training can provide added familiarity with a country's products and systems. Additional financial resources would be necessary for the FAA to provide this assistance more globally.

Environment

Environmental standards and regulations may have a significant impact on future competitiveness of U.S. and European aerospace companies. There are two primary areas of concern. The first area is European environmental policies and practices affecting airline operations within Europe. In spite of the single European directive on aircraft noise, there is significant variance among EU member states on how that directive is implemented into national law and how it is enforced. Depending upon how they are drafted and enforced, these laws could have a direct impact on U.S. airlines operating in Europe as well as an indirect impact on equipment produced by U.S. manufacturers.

The competitive impact of emissions-related policies must also be carefully monitored. Many European governments appear unwilling to wait for international agreement before putting domestic emissions-related measures into place. The European Commission and Parliament are considering additional EU guidance or requirements related to emissions-based operating restrictions and fees at European airports. U.S. airlines and manufacturers will be affected by emissions-related charges and operating restrictions imposed in Europe. European standards could include prohibiting the flight in Europe of aircraft or airlines exceeding a particular emissions standard. Statements made by EU officials indicate that EU emissions targets are likely to be quite high and possibly very difficult for U.S. companies in particular to meet. These measures appear to be politically motivated in much the same manner as noise-related restrictions. There has been little, if any, analysis offered to demonstrate the environmental

benefits of the measures, echoing the complaints raised during the “hushkit” dispute (Section 8.b.).

The second area of concern relates to development of future global environmental standards and policies. European countries have unsuccessfully pressed for international agreement to shift from development of technology-progressing standards to technology-forcing standards. This could be especially problematic if proposed standards are designed to favor products of certain manufacturers, as has been the case with some proposed standards discussed within ICAO. Another area of concern is the types of standards under development. The U.S. government is working with other ICAO members to study the interrelationships among various types of emissions and identify alternatives for reducing the overall environmental impact of aviation. European officials have expressed concern that this study process is too slow.

The United States needs to develop an appropriate strategy on civil aviation noise and emissions, and to consider options for future contributions to global standards and procedures in ICAO and elsewhere. It is critical that U.S. federal agencies continue to participate in development of ICAO standards and recommended practices, and for U.S. regulatory agencies to then adopt domestic regulations that are consistent with ICAO regulations and recommended practices and that promote an internationally harmonized regulatory framework. This includes environmental regulations on greenhouse gas emissions promulgated by the U.S. Environmental Protection Agency and aircraft noise regulations promulgated by the FAA. Equally as important, the U.S. government must be vigilant in identifying and addressing foreign regulations that are detrimental toward or discriminate against U.S. industry.

Air Services

Continued efforts to liberalize the global aviation industry will benefit U.S. as well as European manufacturers. The U.S. government currently is negotiating bilateral and multilateral “open skies” agreements around the world in an effort to open up new markets and enable introduction of new products and services. Manufacturers selling products that enable airlines to serve these new routes may enjoy a competitive advantage. Successful negotiation of a comprehensive agreement extending “open skies” between the United States and all 25 nations of the European Union would create the largest fully liberalized aviation market in the world. Although U.S. and European officials have continued to discuss perspectives on resuming negotiations in 2005, it is unclear what steps will be required to formally restart negotiations.

Passenger airline strategies in the evolving air services market are increasingly predicated on an array of joint ventures and alliances. Internationally, these alliances serve as a surrogate for genuine consolidation, which is artificially impeded today by national laws everywhere governing the ownership and control of airlines. Those strategies appear to be moving in the direction of more consolidation in this industry, particularly among the legacy carriers. It appears to be taking two forms. The first involves airlines joining forces under a holding company structure to deal with the longstanding restrictions on foreign ownership. Air France and Dutch airline KLM followed this approach.

The second form is the further development of the international alliance model. This could take the form of consolidation of alliances or through the deepening of cooperation within alliances. European carriers and their U.S. partners in the major global alliances (e.g. Star, Oneworld, SkyTeam) increasingly see these alliances as a major component of their business. Perhaps one of the greatest policy challenges going forward will be for governments to deal effectively with new consolidation proposals. Changes in international alliances will have a direct impact on domestic competition, as current developments already make clear. The Department of Transportation will actively follow these dynamics and will consider carefully their impact on the industry and consumers. In addition, the Department of Justice will carefully evaluate international alliances under relevant antitrust laws.

Air Traffic Management

As they transform their respective air transportation systems, U.S. and European authorities must continue to pursue interoperability and avoid divergent standards, technologies or policies in order to limit the competitive impact of these advances. A long history of collaboration in this area already exists. U.S. and European authorities were instrumental in development of the ICAO global air traffic management future operational concept endorsed by ICAO members in 2003, and ICAO likely will continue to serve as an important forum for developing common ATM standards and procedures. U.S. and European authorities also are discussing how to extend their history of bilateral collaboration on ATM-related research and policies to new future planning activities.

However, the outlook remains unclear. For example, U.S. and European next-generation ATM systems are anticipated to be largely dependent on satellite navigation systems, based on GNSS satellite constellations and related civil satellite and ground-based augmentation systems. The U.S. system will be based on the existing Global Positioning System (GPS) satellite constellation, as well as civil wide-area and local-area GPS augmentation systems and military-specific applications to support GPS Navigation Warfare (NAVWAR). European authorities are developing their own satellite system, named Galileo, that duplicates portions of the existing GPS system functionality and introduces additional features. U.S. and European authorities have been cooperating bilaterally and multilaterally for many years on GNSS technology development. Nevertheless, political and economic motivations have led to sometimes contentious negotiations on the future relationship between these two systems.

As a result of ongoing negotiations, on February 25, 2004, the United States and the European Union reached agreement and issued a joint statement on overall principles of GPS/Galileo cooperation and interoperability, including assurances that the EC will not introduce regulations in its system to generate revenue from Galileo services that are also provided to the world free of charge via GPS. This was followed by a further agreement in June 2004 that GPS and Galileo signals will be compatible and that civil-use signals will be interoperable.

However, it should be noted that Galileo's published intent is to provide more accurate, reliable, and seamless coverage than GPS—with associated charges for these additional services. From a U.S. competitive air transportation aspect, satellite navigation may begin to resemble the market

for ATM automation systems described earlier. That is, the development and deployment of a broadly accepted level of service(s), divergent from those available from the United States, may become the de facto global standard. Canada, China, India, and Israel have already announced/signed agreements in support of Galileo. Galileo is scheduled to become operational in 2008, while the next generation GPS constellation (GPS III) is scheduled to come on-line in approximately 2012. If successful, the economic and competitive consequences of Galileo's "first to market" for some enhanced features are unclear at this time.

While the United States operates the largest air traffic management system in the world, there is clear evidence that other nations and air traffic management providers envision and have articulated goals of surpassing U.S. technology and operational efficiencies. To meet the challenges of an ever-more-competitive global market, the United States must resolve a suite of underlying policy questions (mandating air transportation equipage levels, future standards, etc.) and develop a strategy to move forward the large installed infrastructure base that historically was leading-edge but is now in jeopardy of falling victim to a technology leapfrog by other nations.

Airports

In the near term, U.S. and European authorities will continue work to expand existing airports and plan for development of new facilities to increase efficiency and accommodate introduction of new aircraft such as the A380. Such developments likely will be done in line with existing regulations and policies. The long term outlook for airport development and expansion in the United States and Europe largely will depend on the outcome of future air transportation system planning efforts, and the ability of airports to accommodate continued growth in service.

Export Controls and Security

U.S. and European authorities are in the process of reviewing export-control-related regulations and policies. Resulting revisions could impact collaboration and trade for both U.S. and European companies. Consultation among U.S. and European authorities as they consider requirements for new security-related technologies used on commercial aircraft could help to ensure that export controls do not provide an unfair competitive advantage for one manufacturer or the other.

Mergers

U.S. and European governments are not currently pursuing major revisions to merger and acquisition policies. Transatlantic collaboration on policy and merger reviews through formal working groups will help to narrow any remaining differences in government policies. Nonetheless, it will be important to carefully monitor aerospace merger reviews in the future as consolidation of the aerospace industry continues, especially any potential competitive effects of establishing new national champions such as mergers between EADS and Thales or SNECMA and SAGEM.

Taxation

Aviation-specific taxes and fees do not have much effect on the competitive standing of U.S. vs. European manufacturers in global markets. However, they do affect the ability of airlines to purchase and operate aircraft, thereby affecting the overall manufacturing sector. Reduced taxes and fees would reduce costs to aviation service providers and passengers and enable service providers to purchase more equipment, thereby benefiting U.S. aerospace manufacturers.

Non-aviation-specific taxes directly affect aircraft manufacturers as well as operators. In particular, many U.S. aerospace companies benefited from since-repealed Foreign Sales Corporation and similar tax policies, based upon their volume of international sales. The exact impact of new tax provisions adopted in 2004 on U.S. companies is unclear. However, since the European tax regime remains unchanged, European manufacturers may now enjoy a competitive price advantage in global competitions relative to their U.S. competitors. In addition to current reforms of U.S. tax law, the U.S. government is seeking a permanent resolution of these issues in the WTO Doha Round by revising rules related to the treatment of border adjustments for internal taxes.

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Appendix

Legislation

P.L.108-176, Section. 819. – Report on Certain Market Developments and Government Policies

Within 6 months after the date of enactment of this Act, the Department of Commerce, in consultation with the Department of Transportation and other appropriate Federal agencies, shall submit to the Senate Committee on Commerce, Science, and Transportation, the House of Representatives Committee on Science, and the House of Representatives Committee on Transportation and Infrastructure a report about market developments and government policies influencing the competitiveness of the United States jet transport aircraft industry that—

- (1) describes the structural characteristics of the United States and the European Union jet transport industries, and the markets for these industries;
- (2) examines the global market factors affecting the jet transport industries in the United States and the European Union, such as passenger and freight airline purchasing patterns, the rise of low-cost carriers and point-to-point service, the evolution of new market niches, and direct and indirect operating cost trends;
- (3) reviews government regulations in the United States and the European Union that have altered the competitive landscape for jet transport aircraft, such as airline deregulation, certification and safety regulations, noise and emissions regulations, government research and development programs, advances in air traffic control and other infrastructure issues, corporate and air travel tax issues, and industry consolidation strategies;
- (4) analyzes how changes in the global market and government regulations have affected the competitive position of the United States aerospace and aviation industry vis-à-vis the European Union aerospace and aviation industry; and
- (5) describes any other significant developments that affect the market for jet transport aircraft.